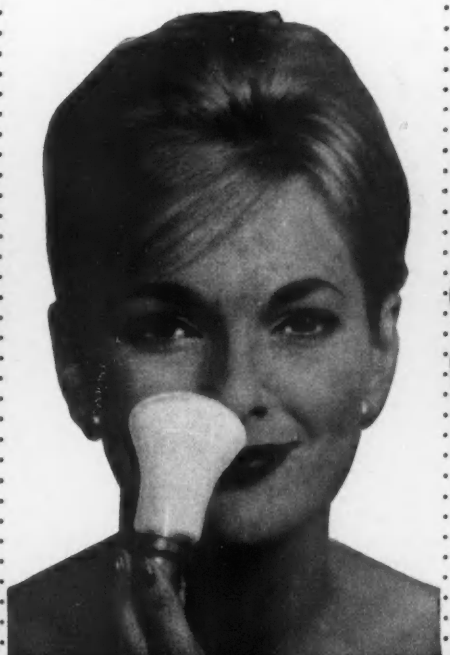
31 AUGUST 1961

ONE SHILLING
AND SIXPENCE

# ELECTRICAL TIMES



## Why 4 out of 5 women go for **Mazda** Netabulb

4 out of 5 women prefer a smaller bulb that has a neater, trimmer shape.
**They go for NETABULB**

4 out of 5 women like a bulb that's snug in the smaller modern fittings.
**They go for NETABULB**

4 out of 5 women prefer a bulb whose whiter light is kinder to the eyes.
**They go for NETABULB**

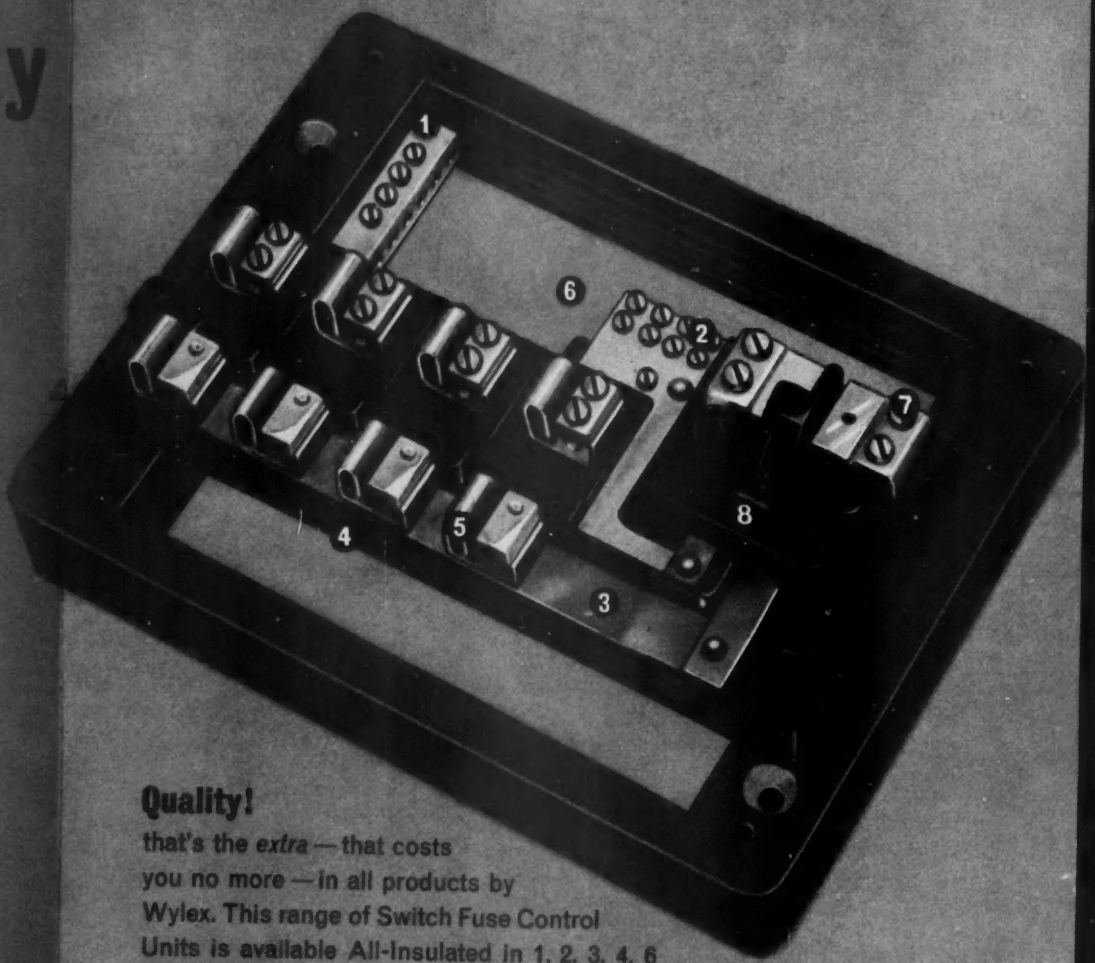
**Mazda** lamps stay brighter longer

A.E.I LAMP AND LIGHTING CO. LTD.

4869

# Wylex build quality

## *into Switch Fuse Control Units*




1. Earth Bar always provided.
2. All Terminals easily accessible.
3. High grade electrolytic copper Bus-Bar.
4. Current-carrying components mounted on non-track Mouldings.
5. Fuse Contact Clips of Special design to ensure positive contact.
6. Ample wiring room.
7. Screws have domed ends — cannot cut into cables.
8. Incorporates WYLEX Switch — proven by years of extensive service.

**Quality!**

that's the *extra* — that costs you no more — in all products by Wylex. This range of Switch Fuse Control Units is available All-Insulated in 1, 2, 3, 4, 6 and 8 way and Metalclad 3, 4, 6 and 8 way, 250v. S.P.&N. Especially easy to stock and make up, to any combination of fuses — rewirable or cartridge. Features the *proven* WYLEX switch with silver-to-silver contacts and sturdy mechanical components.

**Wylex Distribution Boards**

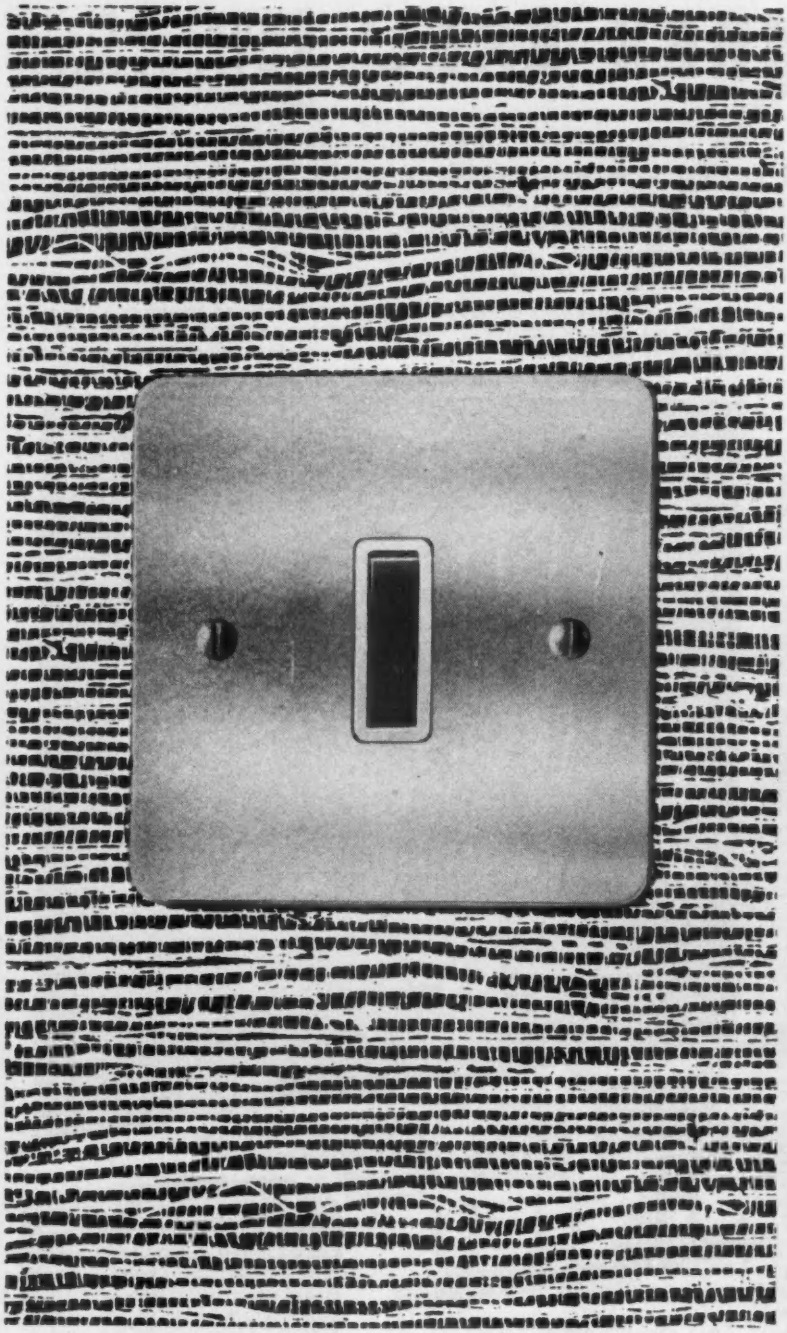
*contemporary to the range of Switch Fuse Control Units available in 4, 6 and 8 way. All-Insulated and Metalclad.*

WYLEX

## Wylex build quality into . . .

SWITCHES · SWITCHED SPUR BOXES · PLUGS & SOCKETS
COOKER UNITS · SWITCH FUSE CONTROL UNITS

**GEORGE H. SCHOLES & CO. LTD. Wylex Works, Wythenshawe, Manchester 22**



Styled to harmonize with modern decor.

We recommend: PLATE — Pastel Silver
SWITCH TRIM — White
ROCKER — Black

Three 'tones' to blend with any colour scheme, **unobtrusively** yet with **distinction.**

**Walsall Conduits Ltd.**

EXCELSIOR WORKS · WEST BROMWICH

Walsall

**WAL-ROK**

SWITCH ASSEMBLIES

latest in design to suit any contemporary scheme

TOUCH CONTACT

A

# The 'MEMREX-EXEL' Range of Switchgear

Complies with B.S. 2510 · 1954

**RATINGS:**
**SWITCHES 10, 15, 30 AMPS**

**SWITCHFUSES:**
**10-15-30-60 AMPS**
**500 VOLTS**

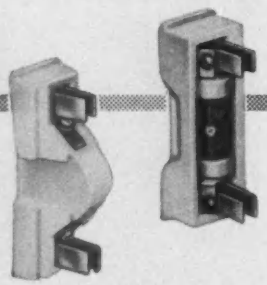
This new range of "Memrex-Exel" switchgear provides one of the most up-to-date and technically advanced ranges of 500 volt industrial switchgear yet offered to the industry. Modern styling, sound technical performance and compliance with all relevant British Standards Specifications are basic essentials.

The cases are of one piece pressed steel with hinged covers, rustproofed and finished grey stove enamel.

Three semi-pierced knockouts are provided at top and bottom and one knockout at left hand side of case for coupling switchgear to adjacent motor starters, etc.

Fuses are of the "Kantark-Exel" pattern the bases of which will accept semi-enclosed rewirable or H.R.C. fuse carriers.

Semi-enclosed rewirable (damper type) patterns comply with B.S.3036:1958.



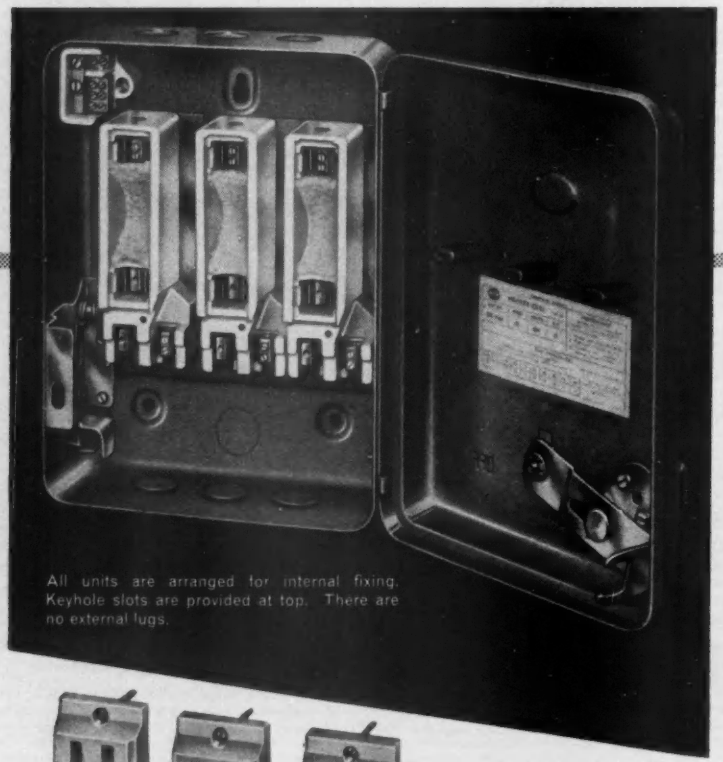
H.R.C. cartridge patterns are interchangeable with semi-enclosed rewirable pattern and comply with B.S.88: 1952.

M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links made to B.S.88: 1952, Appendix 'J' Dimensions, Form A-Offset Tags.

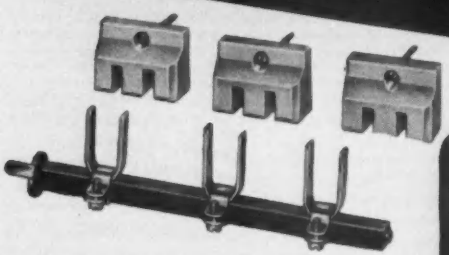
Ample wiring space and a detachable switchbar greatly facilitate the speed of wiring.

All live metal is adequately shielded to avoid accidental contact when cover is open. The porcelain shields also serve as efficient arc barriers.

The range ensures compliance with the most strict interpretation of I.E.E. Regulations (13th Edition) and with the requirements of The Electricity (Factories Act) Special Regulations.



All units are arranged for internal fixing. Keyhole slots are provided at top. There are no external lugs.



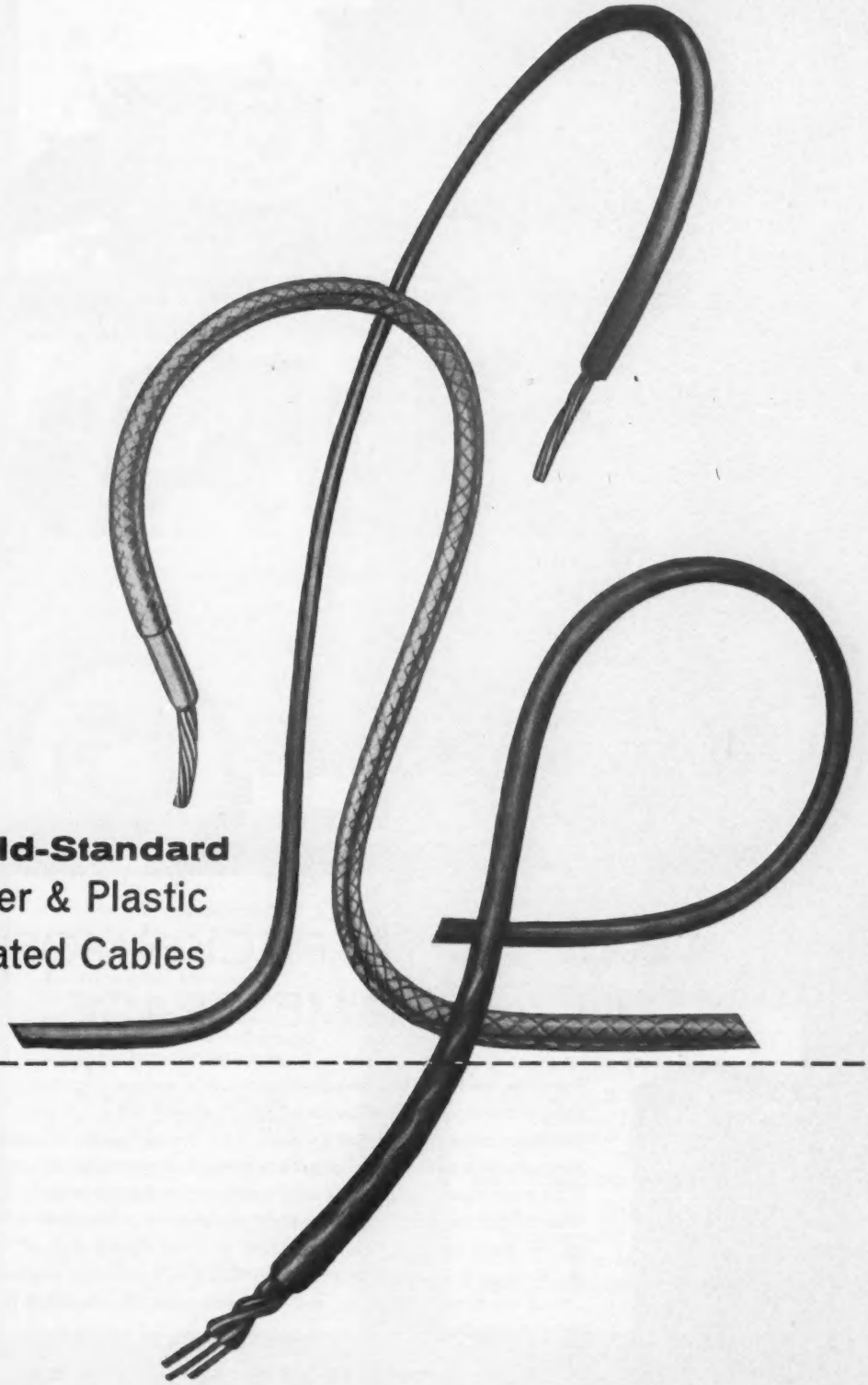
Front operating switch handles are fitted on all units to improve appearance and allow for more compact assemblies on switchboards and panels.

MEM

**THE GREATEST SAFEGUARD AN INSTALLATION CAN HAVE**

*Write for catalogue No. 450 T*

MIDLAND ELECTRIC MANUFACTURING CO. LTD., REDDINGS LANE, TYSELEY, BIRMINGHAM, 11



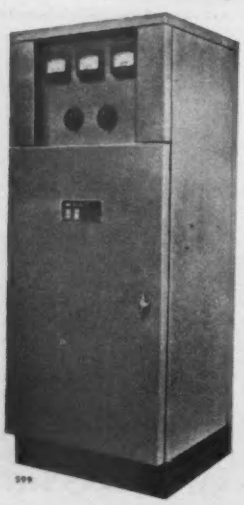
**Enfield-Standard**
Rubber & Plastic
Insulated Cables

**Enfield-Standard Power Cables Limited**

*Head Office and Works:*

BRIMSDOWN · ENFIELD · MIDDLESEX · TELEPHONE: HOWARD 2468

# KEEPALITE PACKS MORE IN THE SAME SPACE



Keepalite, the Chloride Company's automatic emergency lighting system, is now equipped exclusively with the new Chloride Planté cell which occupies only half the space previously needed by cells of the Planté type of equivalent capacity. Keepalite thus adds this important advantage to the many virtues that have made it the most trusted and widely used emergency lighting system in Great Britain. Despite its small size and light weight, the new cell is extremely robust and has all the great length of life associated with the Planté type of construction. As always, the advisory service of the Company's electrical engineers is at the call of electrical contractors and engineers who are interested in emergency lighting installation.

## KEEPALITE

***AUTOMATIC EMERGENCY LIGHTING EQUIPMENT***

**A PRODUCT OF CHLORIDE BATTERIES LIMITED · BACKED BY WORLD-WIDE SERVICE**

Enquiries to: London, Elgar 7991; Bristol 664086; West Bromwich 2361; Leeds 20248; Glasgow, Bridgeton 3734; Manchester, Blackfriars 1158; Belfast 27953

# *Are you getting service?

G.E.C.
Installation Equipment
Group opens, in September, six
large distribution depots
to service its wholesaler
and contractor customers, in

**LONDON** **GLASGOW**
**BIRMINGHAM** **LEEDS**
**GLOUCESTER** **PRESTON**

Each depot employs modern organisation methods and is mechanised as far as possible. With these facilities the Group now offers its customers a speedy service on all catalogue items.

Customers are being individually notified how they will benefit under the new scheme.

To achieve greater efficiency, the Group is withdrawing from some existing depots. Each of the new centres is *exclusively* devoted to these Installation Equipment products:

PIRELLI-GENERAL CABLES;
G.E.C. LOW TENSION SWITCH-FUSEGEAR;
CONTACTORS;
H.R.C. FUSES;
CONDUIT, TRUNKING, DUCT, with ASSOCIATED FITTINGS;
WIRING ACCESSORIES.

*If you are not getting service*

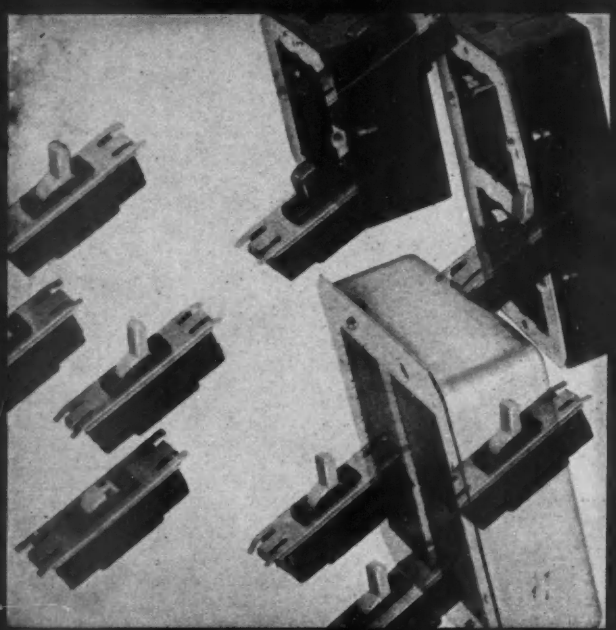
*please write to* R. H. PHILLIPS,
*Managing Director of the Installation Equipment Group at*
The General Electric Company Limited,
*Installation Equipment Group Headquarters, Four Ashes, Wolverhampton*
*Telephone Standeford 441 Telex 33582*

that's the New Approach of G.E.C.

INSTALLATION EQUIPMENT GROUP

complete interchangeability with

# 'MUTAC CLIPPER'



G.E.C. Installation Equipment Group have a *new approach* to designing switches. Now you can fit any of the 11 interchangeable 'Mutac Clipper' switch units into just 3 different sizes of grids and boxes . . . for example, 3 switch units into a standard BS 1299 or plaster depth box. G.E.C.'s new approach makes 'Mutac Clipper' switches unrivalled for ease and speed of assembly . . . ensures that these precision-made, electronically-tested switches give a *guaranteed* long-life performance . . . takes the clicking out of switching.

Interchangeable switch units:

- 5 amp 1 way S.P.
- 15 amp 1 way S.P.
- 5 amp 1 way D.P.
- 5 amp 2 way S.P.
- 5 amp 2 way & off
- 5 amp intermediate
- 5 amp 1 way secret
- 5 amp 2 way secret
- Bell Push
- Neon Indicator
- Blanking Unit

'Mutac Clipper' switches cost no more than ordinary switches to buy and far less to install—that's a result of G.E.C.'s *new approach.* Complete interchangeability of 'Mutac Clipper' enables you to standardise right through a job.

that's the New Approach of G.E.C.

INSTALLATION EQUIPMENT GROUP

***IMMEDIATE DELIVERY*** *of all 'Mutac Clipper' switches from wholesalers throughout the country. If you would like more detailed information ask your wholesaler for 'Mutac Clipper' literature.*

# POWER

Spanning continents... linking nations... transmission lines carry the lifeblood of civilisation to every corner of the globe. *They must not fail.* That is why so many of the world's leading Electricity Authorities specify BJB galvanised forgings and steel work. They know they can rely on them for years of safe, efficient service.

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Head Office: Victoria Works, Wolverhampton. Telephone: Wolverhampton 20441

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Telephone: Chancery 1616

# LEWKANEX

## WIRES for use in high temperature windings

Lewkanex wires are offered in a wide range of sizes meeting the requirements of B.S. 3160 Part 1. These polyester based enamelled wires are suitable for continuous operation in a wide range of applications at temperatures up to 130°C. Under appropriate conditions higher operating temperatures are possible and we invite you to seek further information from our Technical Service Department which is at your disposal in all problems relating to the use of winding wires.

*THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED*

*LEYTON · LONDON · E10*

*One of four 120 MVA 275/132 kV auto-transformers erected at the Central Electricity Generating Board Super-Grid sub-station, Northfleet West, Kent. (Each unit is equipped with FULLER 132 kV fully insulated high-speed resistor on-load tap changer.)*

Modern plant and 40 years' experience ensure that we are particularly well-equipped to manufacture transformers up to the largest sizes and the highest voltages. Thanks to our long association with Asea of Sweden, we have access to an unrivalled experience of 380 kV practice. Our up-to-date equipment includes a vacuum drying chamber with a capacity of 7,000 cubic feet suitable for the treatment of the largest units.

consult-

**FULLER ELECTRIC**

A member of the Hawker Siddeley Group

*Sole U.K. representatives for ASEA Sweden*

FULLER ELECTRIC LIMITED
FULBOURNE ROAD LONDON E.17
Telephone: LARkswood 2350

*Also at Birmingham, Glasgow and Manchester*

# Whichever way you look at it

Whichever way you look at it, SANDACLAD Switchgear is 'just the job' Perfect as can be in conception, design and manufacture it bears the unmistakable stamp of quality. From our point of view, SANDACLAD Switchgear —indeed, every Sanders product—embodies the best of modern techniques both in design and fabrication. For the electrician SANDACLAD Switchgear offers the simplicity of speedy, easy wiring and the elimination of time-wasting frustrating re-adjustments. And the user can have complete confidence in the capability of SANDACLAD Switchgear to perform its allotted task and to carry its designated loading. Dependable, reliable and as pleasing in appearance as such equipment can be, SANDACLAD Switchgear provides safe, immediate and lasting control of electrical power.

SANDACLAD SWITCHGEAR IS RIGHT IN EVERY ASPECT

**SANDERS**

WILLIAM SANDERS & CO. (WEDNESBURY) LTD. · FALCON ELECTRICAL WORKS · WEDNESBURY · STAFFS

# NEWS SHEET

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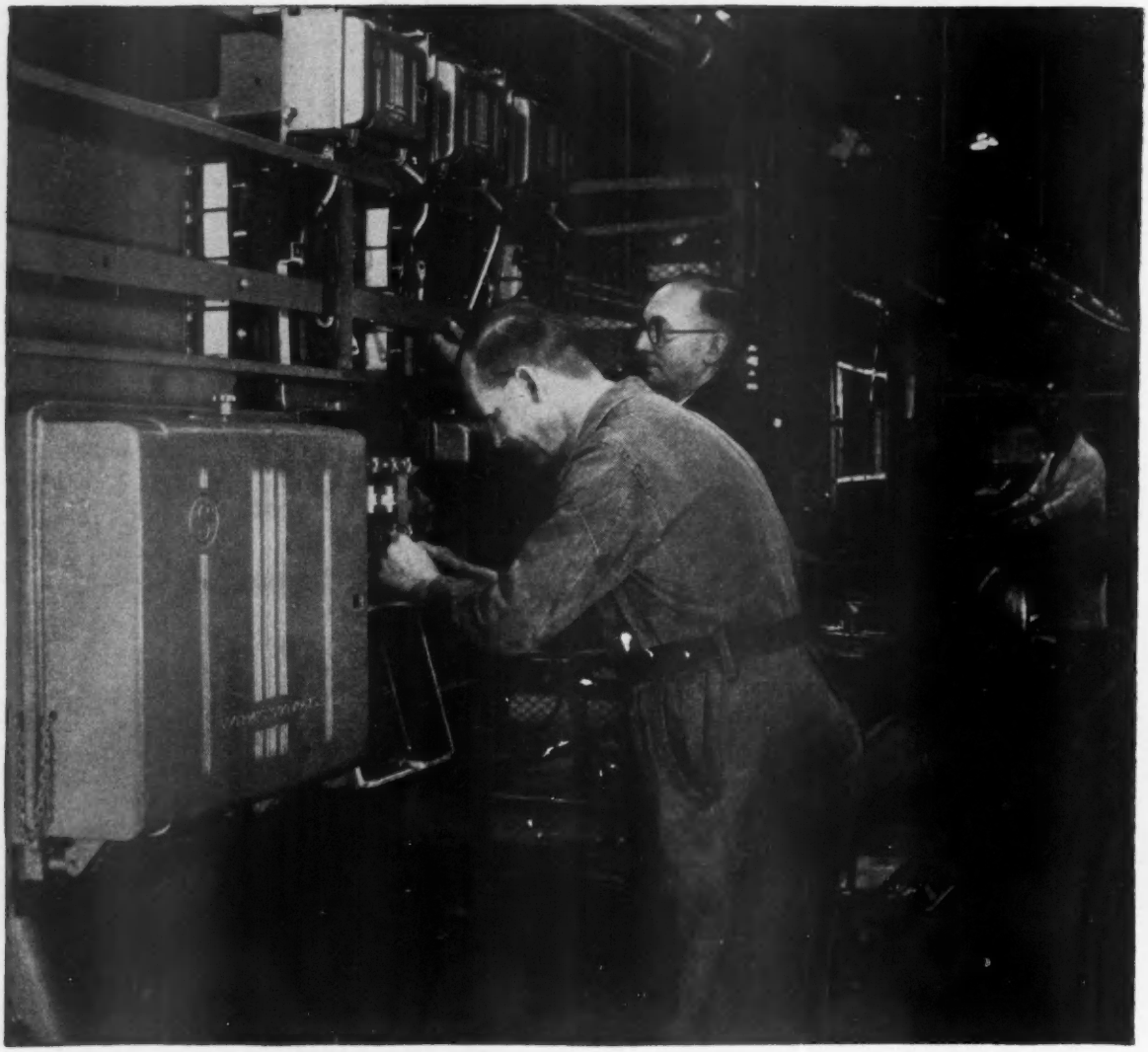

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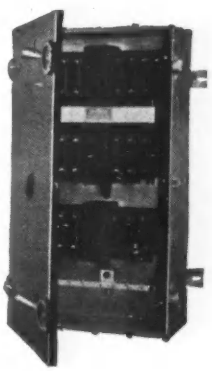
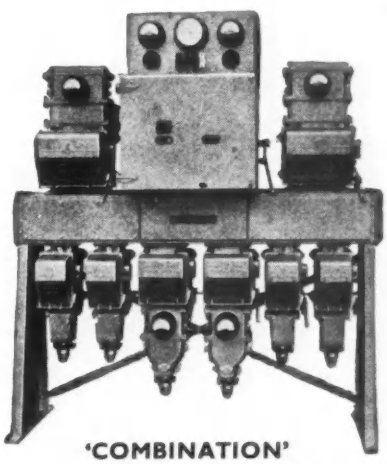
# THE STANDARD OF QUALITY AND PERFORMANCE THE WORLD OVER

TYPE 'T'
H.R.C.
FUSE-LINKS
(35 MVA at 440 Volts A.C.)

'RED SPOT'
H.R.C.
FUSE FITTINGS

'RED SPOT'
HEAVY DUTY
FUSEBOARDS





'COMBINATION'
FUSE-SWITCHBOARDS

'ENGLISH ELECTRIC'
manufacture a wide range of
Electrical Distribution Equipment
including:

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'RED SPOT' H.R.C. FUSE FITTINGS
'RED SPOT' FUSEBOARDS
'SUPERFORM' SWITCHBOARDS
'SUPERFORM' PACKAGED SUBSTATIONS
'COMBINATION' FUSE SWITCHBOARDS
'COMBINATION' FUSE-SWITCHES
OVERHEAD BUSBAR SYSTEMS
OPEN TYPE SUBSTATION BOARDS ETC.

'ENGLISH ELECTRIC'

**fusegear**

FUSEGEAR DIVISION, EAST LANCASHIRE ROAD, LIVERPOOL 10
The English Electric Co. Ltd., English Electric House, Strand, London, W.C.2

FG.66A

C

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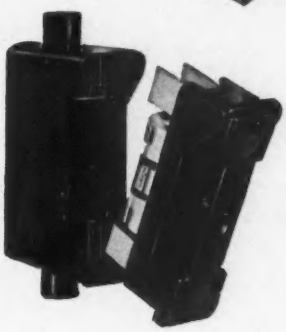
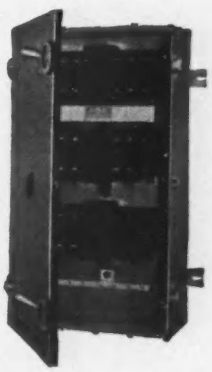
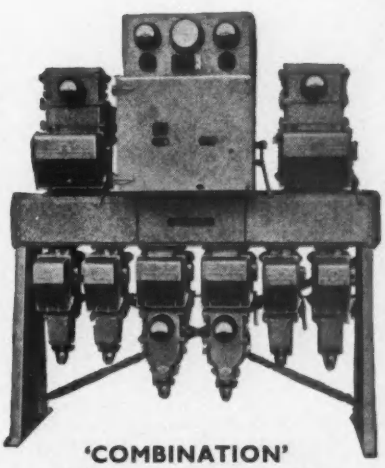
FUSE-LINKS
(35 MVA at 440 Volts A.C.)



'RED SPOT'
H.R.C.
FUSE FITTINGS

'RED SPOT'
HEAVY DUTY
FUSEBOARDS





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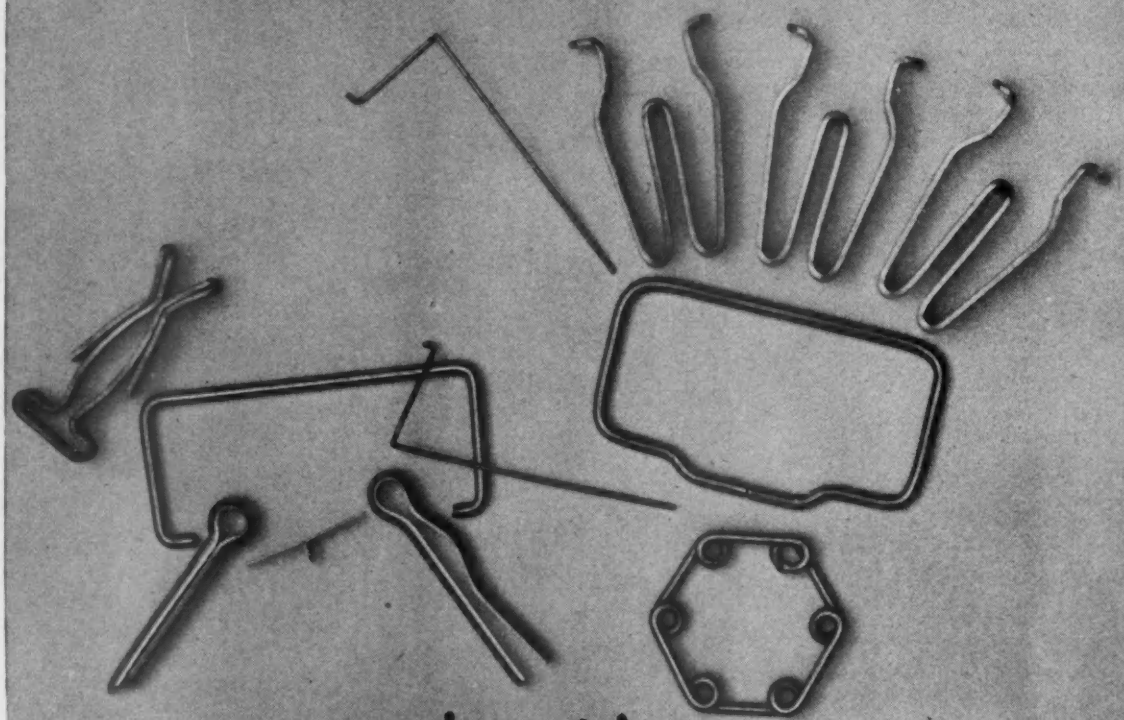
For the electrical market



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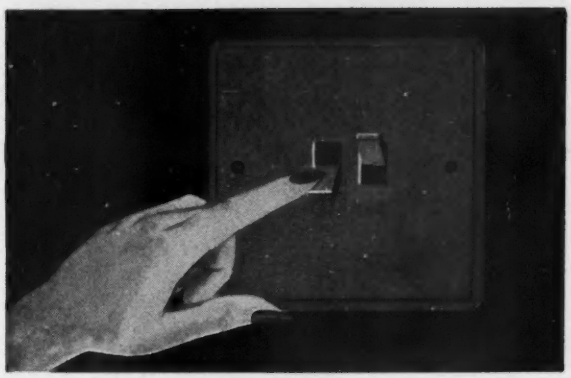
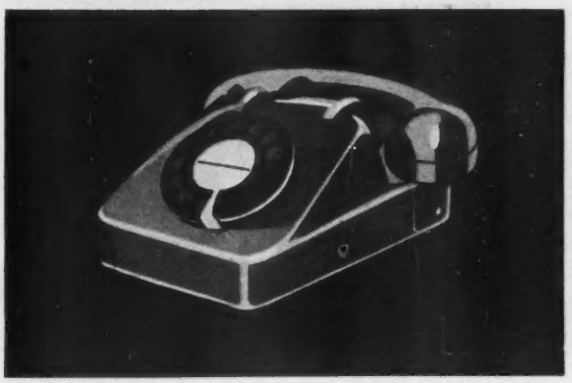
We not only make wire shapes precisely to specifications, in practically any material we also manufacture parts in strip, and undertake Spot welding.





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Thorn Electrical Industries Limited who pioneered the commercial use of electroluminescence in the form of Panelume lamps for aircraft cabin signs, are now able to offer this new light source for domestic applications.

Panelume lamps are rugged, long-life, luminous steel panels that have no filaments, no cathodes, no glass envelopes. They are particularly suitable for incorporating into products which need to be seen in the dark. Other features include:

Surface Brightness – 1 to 3 foot lamberts.

Life Expectation – 40,000 hrs. to half brightness.

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Panel Size – Maximum dimensions for a single panel are 10″ x 8″.

Colours Available – Blue and green.

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# PERMAFLON = $(C_2F_4)n$ (P.T.F.E) *

## in any shape or form required

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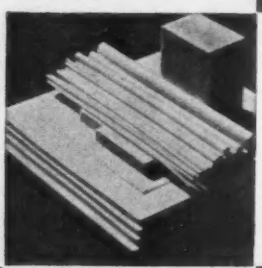
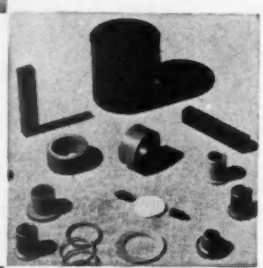
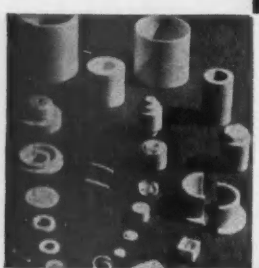


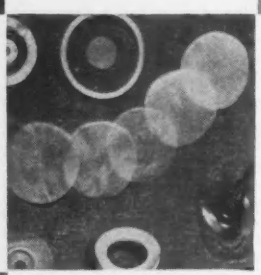
Sheets, blocks & rods



Loaded bearings & washers



Machined/moulded insulators



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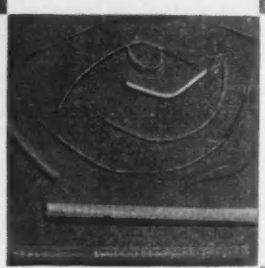

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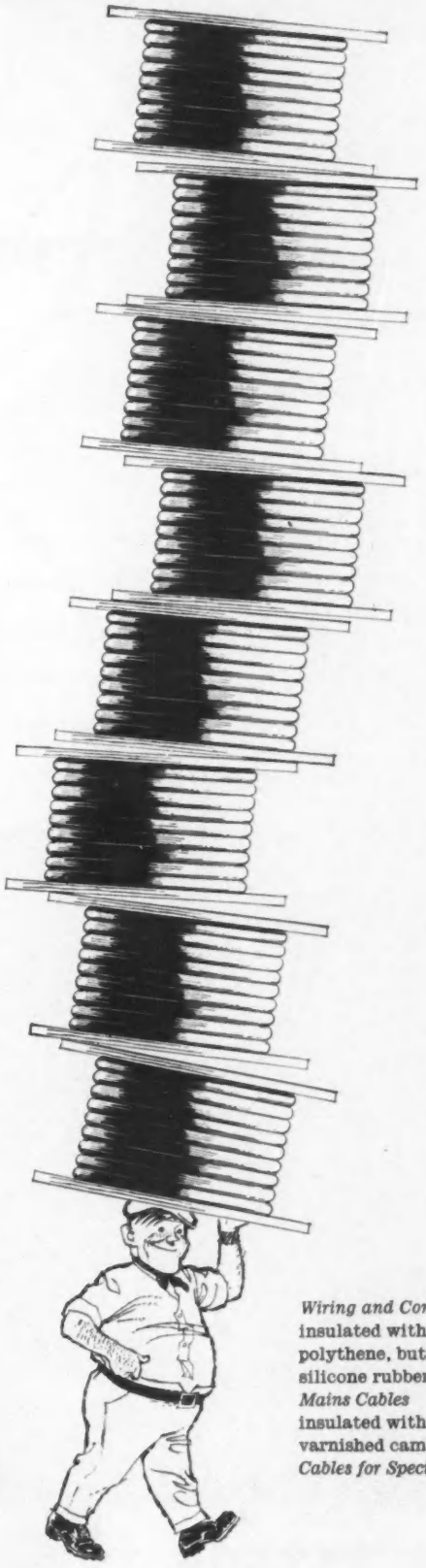

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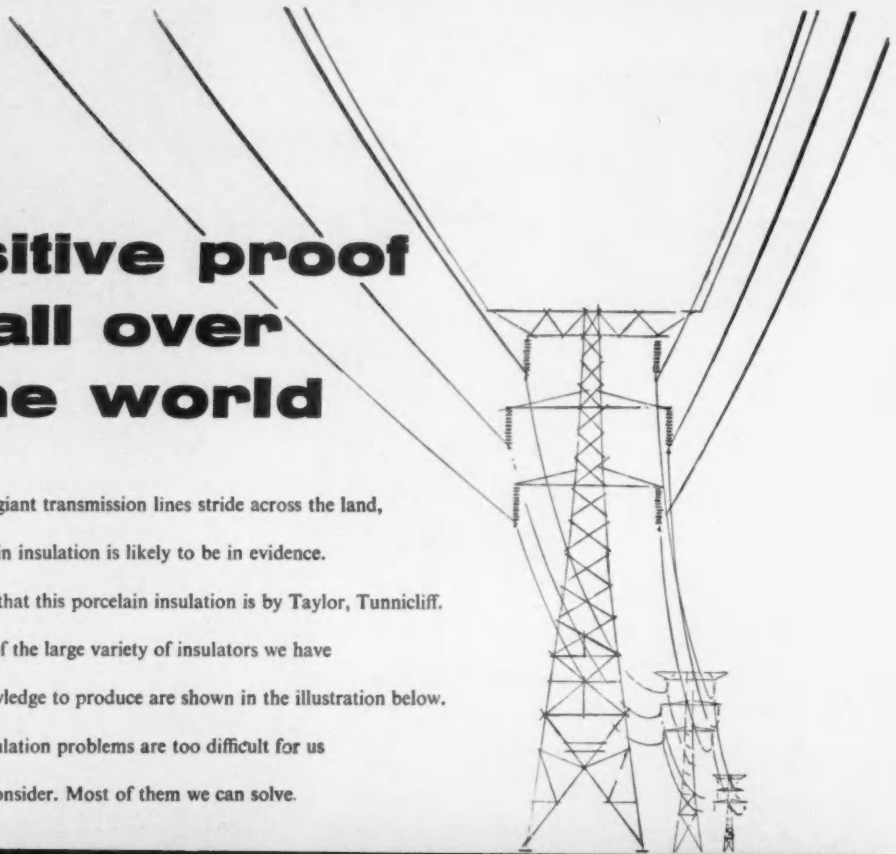

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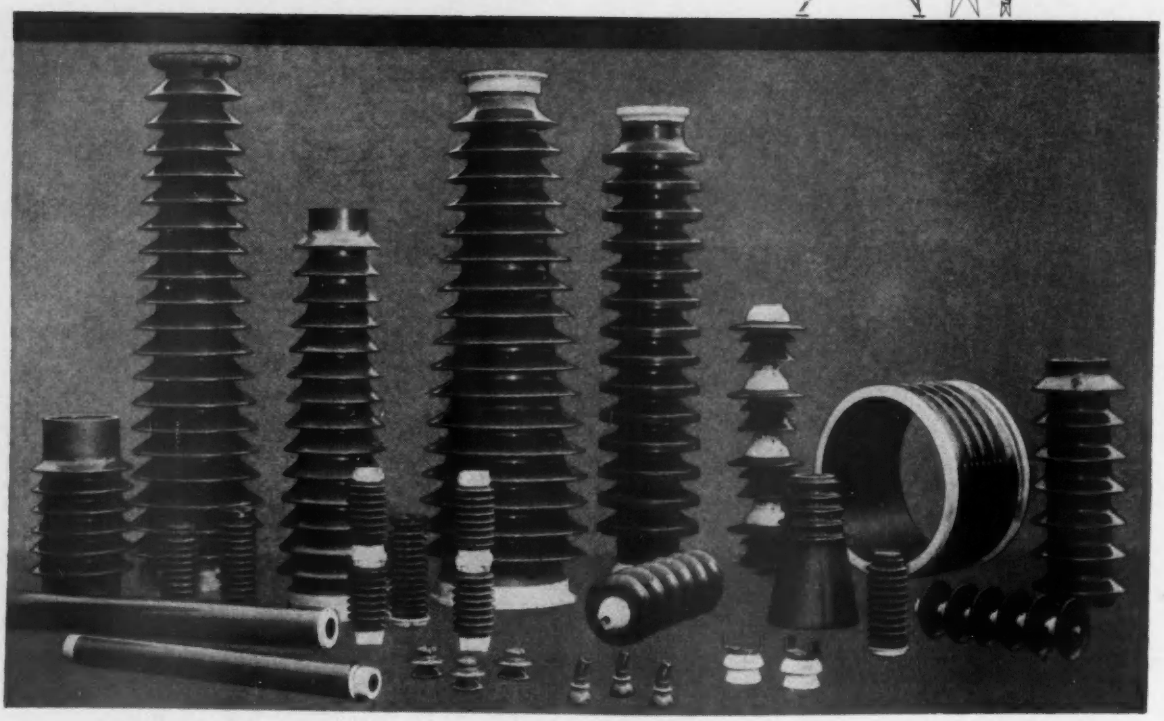

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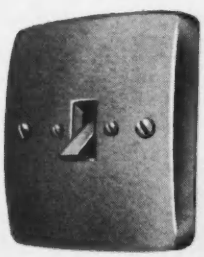
1936

*Pyrotenax Silver Jubilee*

IN TODAY'S CHANGING WORLD...



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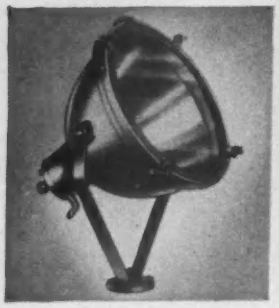
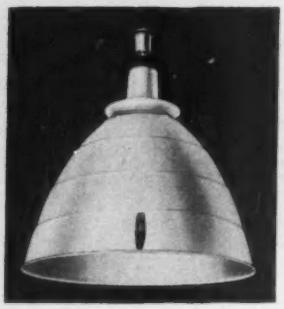
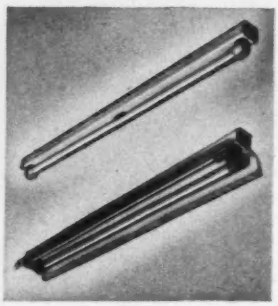


The Simplex General Purpose Floodlight Projector is available in narrow beam, wide angle, and elliptical beam types. The heat resisting glass front is set in a weatherproof ring.
150w—2000w lamps.

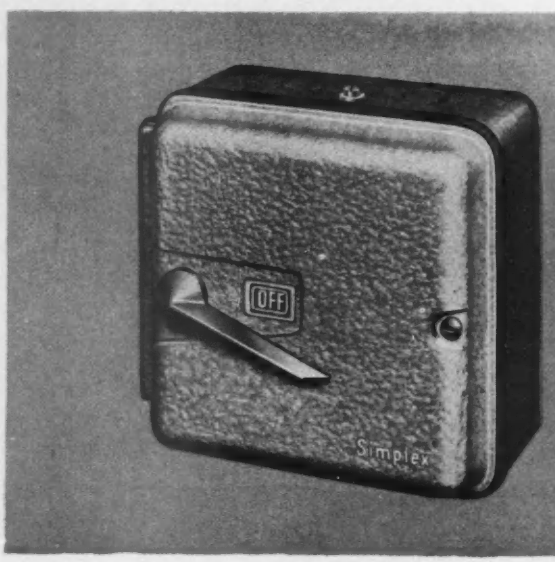


The Simplex Airflo high-bay fitting is extremely light to handle. Its one-piece spun aluminium reflector is self-cleaning. The Simplex Discon device included with this fitting allows instant connection to the conduit system.
250w—1000w lamps.

The Simplex Wall Bracket is just one of a most comprehensive, all-purpose Screwglass range. These modern fittings are weatherproof and corrosion resistant and are available in colours.
40w—200w lamps.



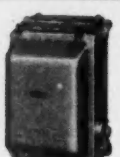
The Simplex ACF (anti-corrosion fluorescent) fitting is protected by a specially patented process that will not rust even in the heaviest corrosive atmospheres.
20w—125w tubes.




The Simplex Star switchfuse designed for front operation and for either HRC or rewireable fuses. The Star range of 500 volt switchfuses, distribution fuseboards, busbar chambers and switchboard assemblies is complementary to the Regent and Monarch ranges of Simplex switchgear.

In the electrical field, Simplex have been out in the lead for 60 years. Significant? Not very. We are looking ahead, not back. We are very happy to be so far in advance now, at this point in time. We intend to stay there next year, in ten years, as long as the best brains in the industry can keep us there. This isn't just a paean of self-praise. It's a cogent reason for keeping in touch with Simplex developments, for specifying Simplex equipment, for thinking of Simplex first, every time.

Simplex Regent range. Robust but stylishly designed 500 volt switchgear of conventional construction.



Simplex Monarch 500 volt 150 and 300 amp switches and fuse switch of robust all-cast construction suitable for heaviest duty.

# Simplex

**SIMPLEX ELECTRIC COMPANY LIMITED**
**CREDA WORKS, BLYTHE BRIDGE, STOKE-ON-TRENT, STAFFS.**
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ELECTRICAL DIVISION *Detailed literature available on request*

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An actual phase to-earth fault is applied momentarily and the Tester checks that the prospective fault current of three times the fuse rating can flow.

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The installation was carried out — under extremely adverse weather conditions — by the Contracting Staff of the Midlands Electricity Board who affirm that the ease of handling the cables and the simplicity of jointing were important factors in the speedy completion of the job.

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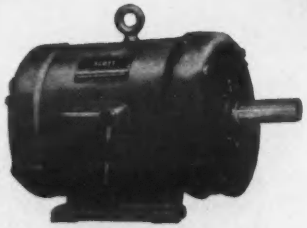
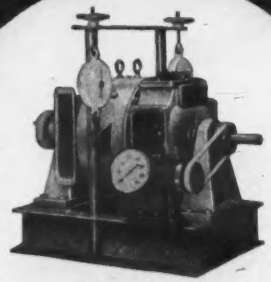
MARINE MOTORS, ETC.

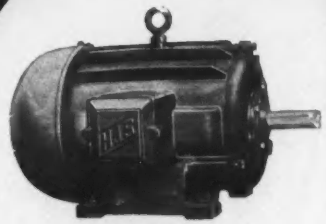


A.C. DRIP PROOF MACHINE

A.C. VERTICAL FLANGE TYPE



DYNAMOMETER FOR COLLEGE USE



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## silicon controlled rectifiers

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| Maximum forward current, 180° conduction | 26A | 16A |
| Maximum surge current | 580A | 360A |
| Maximum mean gate power | 0·5W | 0·5W |
| Maximum sustaining current | 50mA | 25mA |
| Maximum forward or reverse leakage current | 20mA | 20mA |
| Typical turn on time | 2$\mu$s | 2$\mu$s |
| Typical turn off time | 20$\mu$s | 20$\mu$s |

| Maximum forward and reverse voltage, peak | 25 | 50 | 75 | 100 | 150 | 200 | 250 | 300 | 350 | 400 |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 ampere | CS32B | CS32C | CS32D | CS32E | CS32G | CS32J | CS32K | CS32L | CS32M | CS32N |
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Applications include, static switching, control systems, regulation and control of a.c. and d.c. supplies, static inverters, constant voltage supplies, etc.

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Dept. ET6/61 Rectifier Division, Unit Section

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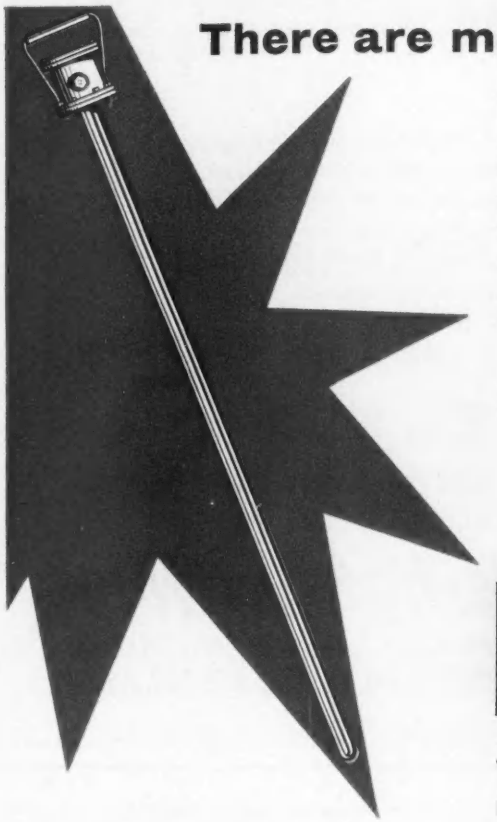

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**Problem:**

how to achieve steam tight joints on H.P. Turbines?

**Solution:**

use Backer tie-rod heaters for expansion-tightening of the bolts.

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# Cut CONTROL GEAR ASSEMBLY COSTS with—

# BETA

## TERMINAL BLOCKS

now available in

**Moulded Nylon**

**with smaller dimensions**

The Beta Terminal Block has been designed for the simple and economical grouping of any number of ways. Extra ways can be inserted without dismantling or further drilling. Only two fixing screws are required up to 12 ways. Provision is made for numbering each way individually or in groups. Transparent covers are available if required.

Moulded from Nylon, giving high mechanical strength and vastly increased resistance to tracking. Fitted with 2 B.A. phosphor-bronze studs and brass connecting link. Suitable for currents up to 20 amps at 660 volts. APPROVED BY CENTRAL ELECTRICITY GENERATING BOARD.

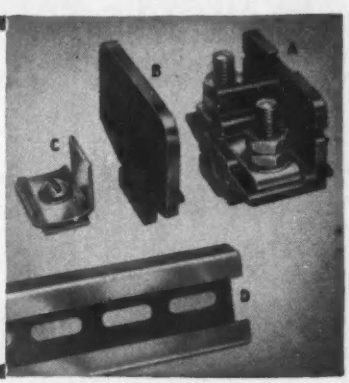
**BASIC UNITS**

**A** Body in moulded Nylon with brass connecting link and 2 B.A. phosphor-bronze studs.

**B** Moulded Nylon barrier. Required only at one end of group.

**C** Cadmium plated steel end clamp, one required at each end of group.

**D** Cadmium plated slotted steel channel.

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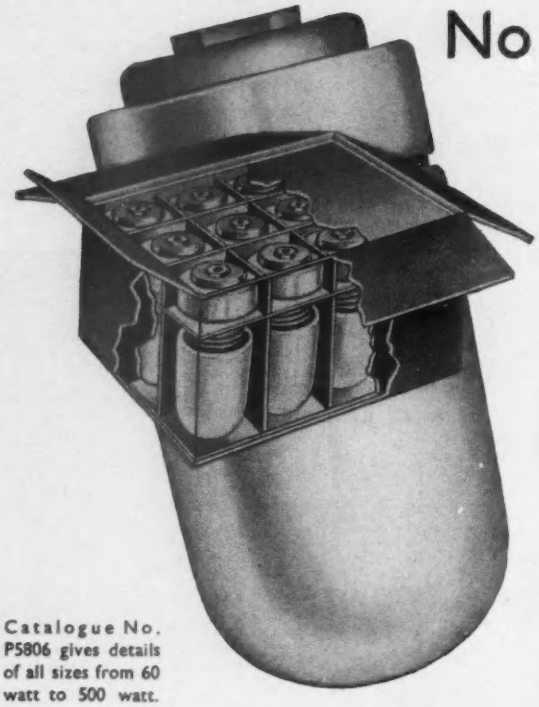

Catalogue No. P5806 gives details of all sizes from 60 watt to 500 watt.

# No **CASE** for complaint

With R.E.A.L. Watertight Fittings supplied by the dozen in this rail-certified container, customers can be certain that they'll arrive in perfect condition, with no lost rubber rings or lampholders . . . no straw-covered glass to clean . . . no breakages. Just a part of the service—R.E.A.L. service!

**REAL**

## *Watertight Fittings*

Patent No. 568702

**PERFECT PROTECTION IN THE PERFECT PACK**

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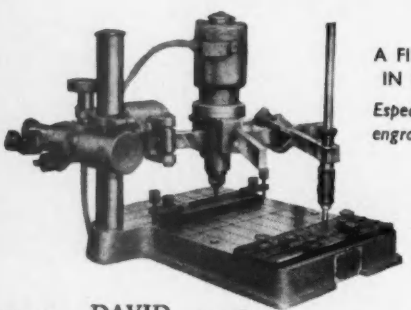
don't miss the important news which appears on Page 5

## *The LOWEST PRICED engraving machine IN THE WORLD!*



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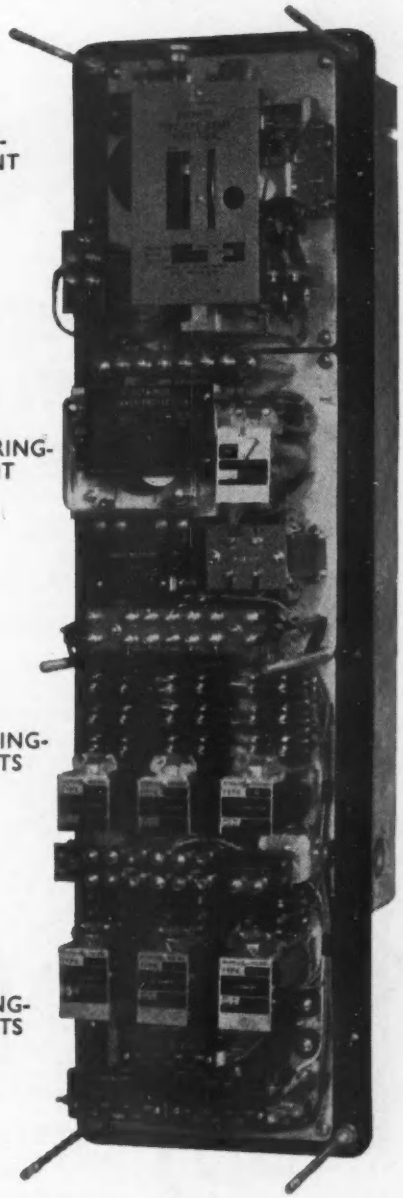


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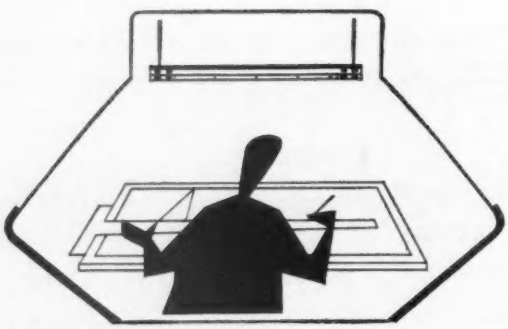

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# ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
Telegrams: Equivolt . Estrand Telephone: HOLborn 6016

**Peak Temperature of Motors with Variable Loading** 287
*by B. J. Prigmore*, M.A., M.SC., A.M.I.E.E.

**Feeding Coal to Richborough** ... ... ... ... 289

**Energy Requirements for Floor-warming** ... ... 290

**H.V. Bundle Conductor Systems** ... ... ... 291
*by Prof T. V. Sreenivasan*, B.E., M.SC.(TECH.), A.M.I.E.

**Electricity in Road Safety** ... ... ... ... 292

**Energy from Wind and Sun** ... ... ... ... 294

**750 kV Line Energised** ... ... ... ... ... 296

**Smaller A.C. Motors** ... ... ... ... ... 302

**New Laboratories at Heaton** ... ... ... ... 303

**Barrier Joint for 33 kV Solid Cable** ... ... ... 304

## *FEATURES*

**Readers' Views** ... ... ... ... ... ... ... 293
**Progress in Patents** ... ... ... ... ... ... ... 297
**Personalities in the Industry** ... ... ... ... ... 298
**New Literature** ... ... ... ... ... ... ... 300
**Exports and Imports** ... ... ... ... ... ... 301
**Problems and Practice** ... ... ... ... ... ... 305
**New Products and Appliances** ... ... ... ... ... 306
**Materials for Electrical Design** ... ... ... ... ... 308
**News of the Week** ... ... ... ... ... ... ... 309
**Overseas News** ... ... ... ... ... ... ... 314
**Company Activities** ... ... ... ... ... ... ... 316
**Commercial Information** ... ... ... ... ... ... 317

**News Sheet** ... ... ... ... ... ... ... ... 11
**Classified Advertisements** ... ... ... ... ... ... 33
**Index to Advertisers** ... ... ... ... ... ... ... 40b

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SUBSCRIPTION RATES: United Kingdom £4, Overseas £4 10s per annum. Canada and USA $12 per annum. Subscriptions are payable in advance and may commence with any issue. Overseas subscriptions may be paid by banker's draft, cheque, international money order or credited to the Electrical Times Ltd., at Coutts and Co., 440 Strand, London WC2. Single copies price 1s 6d. Postage 6d.

## *Dans ce numéro*

**Température de crête dans les moteurs à charge variable** ... ... ... ... ... ... 287

Quoiqu'il existe plusieurs méthodes pour estimer les températures moyennes d'un moteur dont la charge et la vitesse sont variables, on ne peut pas les appliquer dans certains cas, notamment pour la traction électrique. On propose une méthode pour l'obtention de courbes température/temps dans les cas où les pertes et le refroidissement sont très variables. Cette méthode se base sur des ensembles de courbes obtenues avec un moteur échantillon qui fonctionne sur un banc d'essai et qui est équipé de thermomètres électriques. En partant de renseignements d'essai précis, on arriverait à des erreurs inférieures à 2°C.

**Chauffage électrique sous le plancher pendant les heures creuses** ... ... ... ... ... ... 290

Dans un rapport publié par la British Electrical Research Association, on attribue les écarts entre performances estimée et actuelle des systèmes de chauffage électrique sous le plancher pendant les heures creuses, à la prise en considération non adéquate des radiations solaires et métaboliques. Il en résulte que les installations qui semblent être inadéquates en théorie donnent un fonctionnement satisfaisant. Dans un rapport d'étude complémentaire, on examine la performance comparée des systèmes directement enfouis et des systèmes à canalisations.

**Systèmes de conducteurs haute tension en 'groupes'** 291

Des formules sont données qui servent à calculer le rayon équivalent de conducteurs aériens en groupes de deux, trois ou quatre. On examine l'effet de l'espacement des conducteurs secondaires sur les caractéristiques électriques de la ligne, et l'on donne des diagrammes de lignes équipotentielles pour les conducteurs en groupes de trois et de quatre. Enfin l'article déclare qu'en pratique le gain de tension est d'environ 7% pour un système à deux conducteurs, de 16% pour trois conducteurs, et de 25% dans le cas de quatre conducteurs.

## *In dieser Nummer*

**Temperaturspitzenwerte von Motoren mit veränderlicher Last** ... ... ... ... ... ... 287

Obwohl verschiedene Schätzungsverfahren für die Durchschnittstemperaturen von Motoren bei veränderlicher Geschwindigkeit und Last zur Auswahl stehen, sind sie dennoch in gewissen Fällen, wie z.B. bei Fahrzeugmotoren, nicht anwendbar. Es wird ein Verfahren zur Ermittlung von Temperatur/Zeit-Kurven vorgeschlagen, wenn sowohl die Verluste als auch die Kühlungsbedingungen veränderlich sind. Die Kurven beruhen auf Messungen an einem aus der Produktion herausgegriffenen Motor mit eingebauten elektrischen Thermometern. Auf Grund genauer Prüfdaten sollte es möglich sein, eine Genauigkeit von besser als 2°C zu erreichen..

**Elektrische Unterflurheizungssyteme für Anwärmperioden ausserhalb der Netzspitzenbelastungsperioden** ... ... ... ... ... ... 290

In einem Bericht der British Electrical Research Association werden Unterschiede zwischen dem geschätzten und tatsächlichen Verhalten von elektrischen Unterflurheizsystemen, welche nur ausserhalb der Netzspitzenbelastungsperioden angeschlossen sind und die entsprechenden, verbilligten Tarife ausnützen, auf ungenügende Berücksichtigung der Sonnen- und metabolischen Strahlung zurückgeführt. Installationen, welche auf dem Papier unzureichend erscheinen, ergeben trotzdem zureichende Resultate. In ergänzenden Untersuchungen werden Heizsysteme mit direkt eingebetteten Leitern und mit Heizkanälen verglichen.

**Hochspannungsanlagen mit Bündelleitern** ... ... 291

Es werden Formeln für den Aquivalentdurchmesser von Zwei-, Drei- und Vierleiter-Hochspannungsfreileitungen angegeben. Der Effekt des Abstandes der Einzelleiter des Bündels auf die Leitungscharakteristiken wird besprochen und die Aquipotentiallinien für Drei- und Vierfachleiter werden in Diagrammen gezeigt. Aus den Ergebnissen wird geschlossen, dass in der praktischen Anwendung der Spannungsgewinn bei Zweifachleitern 7%, bei Dreifachleitern 16% und bei Vierfachleitern 25% beträgt.

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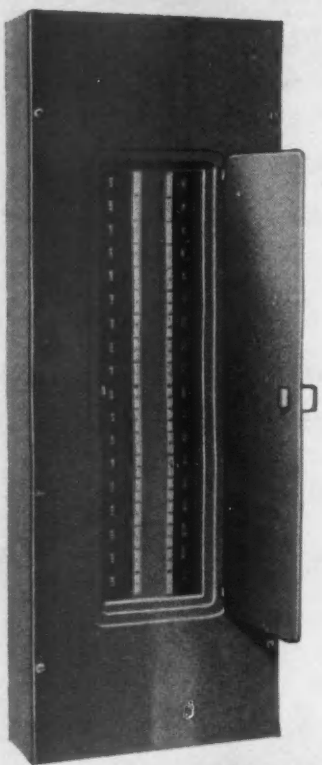

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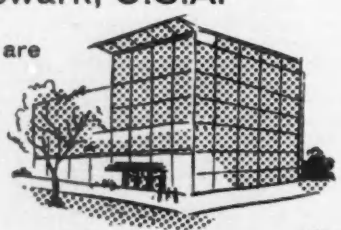

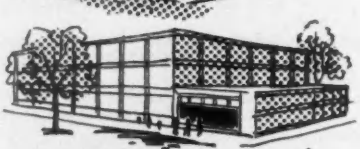

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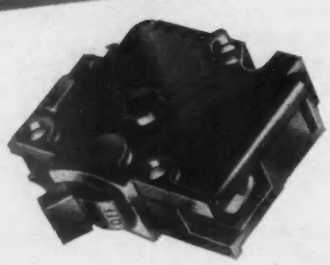

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THURSDAY, 31 AUGUST, 1961

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# *Comment*

## THE BY-PATHS OF POWER

This country has no geothermal energy source, precious little sunshine and experiments with wind power have not been over successful. Its stake in the United Nations Conference on New Sources of Energy held in Rome last week comes more from overseas interests than possible home development, despite the leading part played in wind power. The conference did underline the major effort being put into specialised energy sources over a broad international front. Geothermal power is so tied to the availability of natural heat that it is a thing apart from the other two sources which do have wider possibilities particularly in relatively undeveloped or sparsely populated areas. Great advances have been made in the direct application of solar energy to such tasks as cooking, heating and refrigeration. So far as electricity generation is concerned there are good prospects of obtaining power up to a few kW at costs above five cents per kWh by the high efficiency heavy vapour turbines operating at about 150°C. For wind power the surprising claim is made that in the long term the average energy available is not only extraordinarily uniform but more so than that from water power. It is, however, the short-term wind fluctuations over periods up to ten days that bring the complication of storage facilities. In practical cases this is being solved by a system of load priorities suitable to farm installations, and special interest was aroused by an automatic control system devised by the ERA which permits the non-technical operator to set up the order of load priorities, which are then automatically connected as power becomes available. Wind power generators, however, are going up in size and units of 200 kW are operating, connected in parallel with public networks. None the less, such generators remain very much a tailor-made job designed to suit special conditions of the particular applications.

## GERMAN ELECTRICAL INDUSTRY

With a consciousness of German competition overseas and a growing appreciation in the UK of what entry into the Common Market will mean, we may be excused for looking at some recent figures for the West German electrical industry. According to the State statistical bureau, net production for the first six months of this year was 16·4% up on the same period in 1960, which is a somewhat greater increase than the first half-year's of 1960 and 1959. As in this country, the greatest advance is in low-voltage switchgear (33%) and control gear and instruments (26%), but even motors and generators show an 18% advance for the first six months of this year. Neither do electrical appliances show much sign of recession.

In the category listed as motorised appliances, production was up by 26% with refrigerators noticeably lagging at 9·9% increase. Looking ahead to the second half of 1961, the lower rate of increase on orders in the first six months suggests a lower rate of expansion for electrical plant and equipment later in the year, but, nevertheless, still an increase. For electrical appliances no falling off in the rate of growth is foreseen, although there have been some price reductions. On the question of exports, the situation is obscured by Germany's revaluation of the Deutschmark early this year, and it is not clear how far this will influence trade. The uncertainty of the current political situation has also to be considered. None the less, there is still ample impetus in the German economy.

## FLOOR-WARMING PERFORMANCE

The rapid progress of electrical off-peak floor-warming to success is perhaps more surprising when it is realised that early installations inevitably involved much empiricism. Only when some years of operational experience were available was it possible to check the effectiveness of designs based on calculations used for more conventional heating installations. The more precise measurements possible with electricity have shown that these methods are crude, over-valuing some factors and ignoring others. Earlier this year, a report by the Heating and Ventilating Research Association suggested that miscellaneous heat gains might reduce the heat input required by as much as 30% to 40% of calculated values, while the usually accepted rates of air change were higher than those experienced in practice. The HVRA conclusions were based in part on investigations organised by the Electrical Research Association with the co-operation of area boards, and the evidence is now made generally available with publication of case studies of floor-warming made by the ERA over the years 1951-56. Six installations of different types, ranging from a country house to an office block were studied, and in nearly every case the actual consumption was lower than that calculated by using conventional methods. The discrepancies are, broadly, over-estimate of ventilation and under-estimate of solar and metabolic heat gains. While warning that its results give "indications" rather than point to firm conclusions, the report suggests that for some rooms an installed capacity of only 20% more than the conventionally calculated heat loss will give adequate 24-hour heating with the supply available only 12 hours a day. For most rooms in large blocks of flats the increase is only 50%.

## SITE SAFETY PRECAUTIONS

For some years now the Factory Inspectorate have made clear their concern with working conditions on constructional sites from the point of view of safety. Now 1 March next has been fixed as the date from which new and comprehensive regulations will apply. There was a public inquiry into these regulations after they were published in draft form last October. and the final form which is to become law shows some minor changes from what was first proposed, with the relatively short electrical section affected. The absolute requirement that where electric cables or equipment are present on a demolition site they should be made dead, has been abandoned, but introduced into the regulations is a general requirement that with all electrical equipment involved on constructional sites, "all practical steps shall be taken to prevent danger." A vague requirement of that kind has often proved effective when administered by the factory inspectors, even though it has the disadvantage of leaving the employer never entirely sure if he has met the requirements of the regulations completely. Guidance will no doubt be forthcoming, and it will be channelled through the principal new appointment the regulations create, the safety supervisor to be nominated by contractors who normally employ a staff of 20 or more workmen. The safety supervisor has to advise on the effects of the Factories Acts and supervise safety precautions generally. Since two or more employers can appoint the same person, it seems that the supervisor is likely to be appointed effectively by the main contractor and adopted by the subcontractors on a site.

## IONS TO THE RESCUE

The domestic appliance manufacturer is always looking for new ideas. Major appliances with their competitive prices may be all right for keeping the plant going, but it is useful to have a line where the margins can be stretched a little. How much worse off is his US colleague who has to face far higher saturation figures for his major markets. That is why the list of specialised electrical gadgets is frighteningly long in the US, including appliances the like of which we have never seen in this country. To this list is now added the negative ion generator. No one seems to be quite sure what it does or how it does it, but it is something you connect to the mains and place in a room and hope. It doesn't condition the air, still less does it attempt to purify it, but in some vague way it is said to make you feel better for having it. The problem is to sell it. With a thin sales story the only way is to try it out in the home and hope psychology will do its damndest. But now the further problem appears to have arisen of who is to sell them. Electrical department and appliance stores rightly claim that they should do the selling, while drug stores rightly point out that they are the natural outlets for such a device with medical implications. With the lack of scientific facts, this dilemma seems to be resolving itself by the traditional method first introduced by King Solomon. According to our American contemporary, *Electrical Merchandising*, there are some dozen firms making these negative ion generators—and we tend to think the US appliance market a sophisticated one!

Meteor

*This week's quick summary of electrical news faces advertisement page 10*

# Peak temperature of motors with variable loading

by B. J. Prigmore, M.A., M.Sc., A.M.I.E.E.*

THERE are several methods of estimating the average temperature of a motor in service, even when its loading and speed are variable. Earlier methods[1] entail testing the motor with the same r.m.s. current and average speed as when on load. A more precise method has been developed by Tustin and Bates.[2] This employs on-off testing, so that during the "on" periods the current and speed give the required loading, and during the "off" periods the motor is kept rotating so that the required overall average speed is maintained. This method, basically applicable to cyclic loading in which the duration of each cycle is short compared with the thermal time constant of the machine, has also been extended to give the peak temperature at the end of the "on" part of the cycle.

## Traction Conditions Severe

The most awkward problem in the estimation of temperature rise possibly occurs in the traction application of the d.c. series motor, for peak temperatures may occur in locomotive motors after they have hauled heavy trains up the longer gradients; and in the motors of suburban electric trains after they have traversed the city section of their routes, with many more starts per hour, and lower average speeds, than elsewhere.

Here, not only have the motors both higher losses and lower cooling on the difficult parts of the route, but the high load and low speed are sustained for periods (of maybe half an hour) which are not short compared with the thermal time constant of the motor. Averaging methods are thus no longer valid.

The solution lies in estimating the temperature-rise/time curve of the required part of a motor (usually the armature copper) throughout its run. A method of doing this is outlined in the present article. The basic data are obtained from temperature/time measurements taken on a sample motor on the test bed. Use of these in connection with speed/current/time curves enables the temperature/time curves to be found. If the speed/current/time curves apply, for instance, to different routes from those for which the locomotive was intended, or for more trailers per motor coach on suburban railways, a means is available for assessing, in advance, whether a motor can withstand the different duty without becoming overheated.

The method is, first, to assume that the thermal equivalent circuit of the motor is linear (so that it is valid to superpose temperature/time curves by addition, as is verified for a simple case in the Appendix), and to superpose the heating/cooling transients (as done in Fig. 1) applying to operation for a period $\delta t$ which is much shorter than the thermal time constant of the motor. The sequence of such transients is chosen to correspond with the operating conditions applying during the successive intervals $\delta t$. (Fig. 1 applies to constant-current constant-speed operation.)

Assumption of linearity of the thermal equivalent circuit means that losses are supposed independent of temperature (in practice that the winding resistance remains constant at a value corresponding to a specified standard temperature, $\theta_s$) and that the dissipation coefficients remain constant (in practice that the speed, and hence ventilation, remain constant corresponding to a specified standard speed $n_s$); $\theta_s$ is conveniently chosen as the continuous-rating temperature rise.

Secondly, to refine the temperature/time curve obtained by superposition of transients applying to the linear motor, it is necessary to apply corrections for the departures from linearity. These departures are due to changes both in temperature and in speed. The corrections are themselves obtained as transients, corresponding to a succession of given departures from standard for the succession of intervals $\delta t$.

## Temperature Differences Due to Non-linearity

Let a motor operate with a given current I, and at an average temperature $\theta_a$, for an interval t: its temperature rise will be even greater than it would have been had the average temperature been $\theta_s$ ($\theta_a > \theta_s$) owing to the *extra* losses $I^2R\alpha(\theta_a - \theta_s)$, where $\alpha$ is the temperature coefficient of resistance of the winding referred to $\theta_s$. This additional temperature rise may itself be seen to be a transient if $\theta_a$ is regarded as being different from $\theta_s$ only for the one interval $\delta t$. Superposition of the succession of such transients, of magnitude $CI^2(\theta_a - \theta_s)$ (where C is a constant)

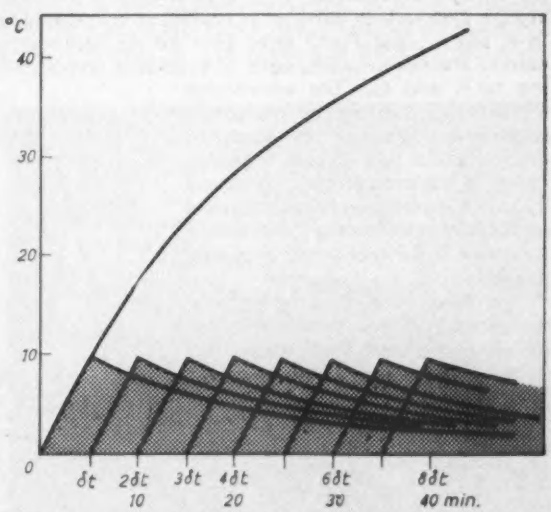



*Fig. 1. Superposition of successive heating/cooling transients for a motor: standard heating transients, 92 A 590 r.p.m.*

* Mr Prigmore is at Imperial College, University of London. In preparing this article the author has made use of some of the information and diagrams in his monograph, "Temperature Rises in Electrical Machines with Sustained Variations in Load and Speed," which was first published by the Institution of Electrical Engineers as Monograph No. 416U, in November, 1960, and was republished in Part C of the *Proceedings* of that Institution.

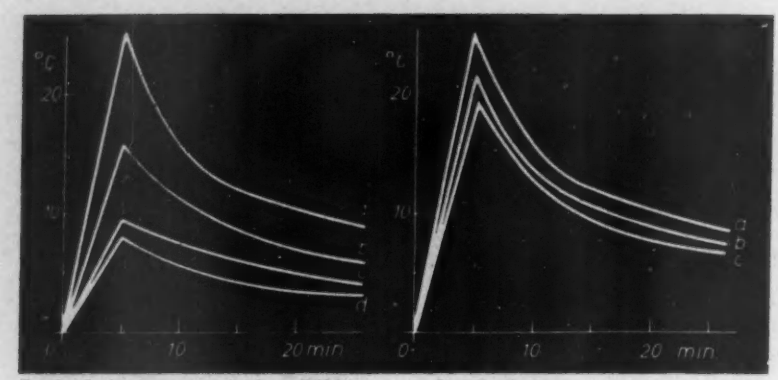



*Fig. 2. Series motor normal voltage (230 V) heating transients: (a) 150 A, (b) 120 A, (c) 92 A and (d) 75 A. $\delta t = 5$ min*




*Fig. 3. Series motor maximum current (150 A) heating transients: (a) 500 r.p.m., (b) 200 r.p.m., (c) 0 r.p.m.*

corresponding to the sequences of I and $\theta_s$ for those intervals, gives the temperature/time correction curve which allows for temperature changes.

Let a motor operate more slowly, at speed n (and hence with lower heat-dissipation coefficients than if at standard speed $n_s$) for an interval $\delta t$. After this interval it will be hotter than if (losses being unchanged) the speed had been $n_s$, owing to the non-removal of some of the losses. The temperature increase is $D\theta_s$ where D is, in effect, the decrease of dissipation coefficient and $\theta_s$ the average temperature rise during the interval. This added temperature rise is itself a temperature/time transient if n is different from $n_s$ only for the one interval $\delta t$. Superposition of the succession of such transients, of magnitude $D\theta_s$, where D is a dissipation correction constant corresponding to each speed difference, gives a temperature/time correction for dissipation (or speed) changes.

## Procedure for a Series Motor

It will be briefly demonstrated how to predict the temperature/time ($\theta$/t) curve for the copper at the centre of the armature slots of a series motor for an arbitrary run.

The current/time and speed/time curves for the run are divided into short intervals $\delta t$, during each of which the current and speed are assumed constant. The families of heating transients for time $\delta t$ for the slot copper have previously been obtained. (Fig. 2 gives these for normal voltage and various currents at conditions corresponding to $\theta_s$ and $n_s$; and Fig. 3 gives them for the accelerating current and lower speeds, again at conditions corresponding to $\theta_s$ and $n_s$.) The uncorrected $\theta$/t curve is obtained by taking the appropriate sequence of transients from Figs. 2 and 3 and summing them. If the average speed is closely $n_s$ and $\theta$ is rarely and little in excess of $\theta_s$, no further estimate is necessary to decide if the motor will withstand the duty.

For different average speeds, and temperatures much in excess of $\theta_s$, it is best to obtain the $\theta$/t correction curve by summing the transients $CI^2(\theta_s - \theta_n)$ for each interval; and the transients $D\theta_s$ corresponding to the different speeds for each interval. (Fig. 5 gives the temperature correction transient; and Fig. 6 the family of dissipation correction transients.) The correction curve is added to the uncorrected curve to give the final predicted curve. Strictly, a new assessment of the correction, based on the refined values of $\theta_s$, should be made, but the error arising from neglecting this is usually less than the experimental error in the data on which the basic transients are based, so a second assessment is unnecessary.

## Test Bed Procedure and Curve Derivation

To obtain the required data a standard speed should be chosen which is roughly the average speed in service (so that the average of the dissipation corrections will be small); and a test current chosen to bring the temperature rise to $\theta_s$, which is best chosen as the continuous-rating rise (so that with an adequately loaded motor the average of the temperature corrections will be small).

The dissipation correction curves are obtained first by heating the motor to a steady temperature as above, and then cooling it at standard speed; and repeating the heating, and following it by cooling at lower, and also higher, speeds. The differences between these cooling curves and that for cooling from the same conditions at standard speed enable the curves of Fig. 6 to be derived.

The temperature correction curve is obtained from a test at high current and zero speed: the consequent heating, due to copper loss only, enables changes in heating due to changes in copper resistance to be found, and Fig. 5 to be derived.

A number of heating/cooling curves is then obtained, the heating being at various currents and speeds, but the cooling always at standard speed. The dissipation and temperature corrections obtained from previous data are then *subtracted* from the heating portions of the curves to give the standard heating/cooling curves; and these are broken down to give the standard transients of Figs. 2 and 3.

## Verification

A 230 V, 92 A force-ventilated series mill motor with embedded resistance thermometers was used to verify the method proposed. The machine had been used earlier by Tustin and Bates[2], and hence was of known characteristics, but, because of the forced ventilation, a severe test of the

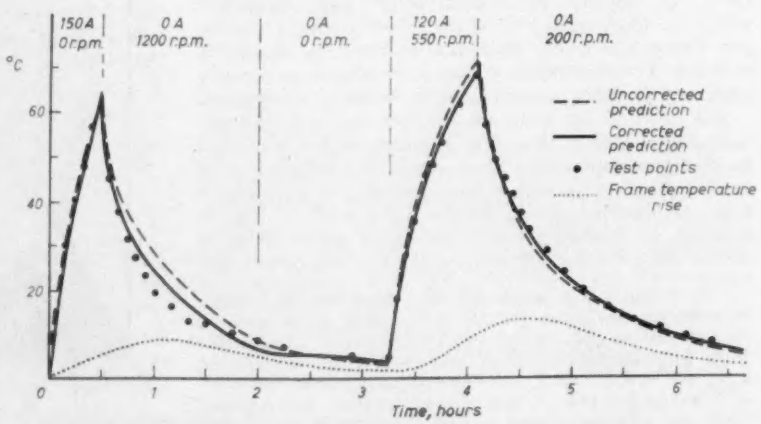



*Fig. 4. Test points and predicted curve for an arbitrary run on a 230 V 92 A mill motor*

validity of the dissipation (speed) correction was not possible.

The test results, accompanied by predicted uncorrected and corrected $\theta/t$ curves, for an arbitrary run of a sequence of extreme conditions, for which $\delta t$ was five minutes, are given in Fig. 4. The temperature measurement could be made to $\pm 2°C$; and the predicted curve is generally within $\pm 2°C$ of the test points. Moreover, the correction always has the correct sign to bring the uncorrected $\theta/t$ curve nearer the test points.

Prediction is less accurate at low temperatures, when the temperature rise of the frame of the machine inhibits the cooling. To reduce errors due to this it is suggested that lower-current tests, causing lower temperature rises, be performed when the frame and other inactive parts are warm.

## Conclusions and Recommendations

A method has been outlined and demonstrated for obtaining temperature/time curves for a motor of which the losses and cooling vary greatly, and for appreciable times, throughout the loading period. Given sufficiently precise test data, errors of under 2°C should be obtained.

The method is of special value for obtaining peak temperatures. A whole run may be followed to obtain the times of the peaks from the uncorrected $\theta/t$ curve: corrections may then be applied for the two hours preceding the highest peak to see if this is too high for too long.

To apply the method, sets of curves obtained after 36 hr to 48 hr of test-bed runs on a motor fitted with one or more embedded electrical thermometers are required. It is recommended that this time be spent on a sample of a type of motor of which several hundred may be produced, since accurate assessment of the range of duties they could withstand would then be possible.

The author is appreciative of the encouragement and advice received from Professor A. Tustin throughout the performance of this work; and to the British Iron and Steel Research Association, and Dr L. N. Bramley, then of its Plant Engineering Division, for making available the motors and laboratory facilities used in performing the tests.

### REFERENCES

1. Carter, F. W.: "Rating and Service Capacity of Traction Motors," *Journal I.E.E.*, 1927, *65*, p. 994.
2. Tustin, A., and Bates, J. J.: "Temperature Rises in Electrical Machines on Variable Load and With Variable Speed," *Proc. I.E.E.*, Paper No. 2031U, April, 1956 (*103A*, p. 483).

**Appendix: To Verify Superposition with a Simple Example**

For the uniform heating of a single body to which Newton's Law of Cooling applies, the temperature rise $\theta$ after time t is given by

$$\theta=\theta_m(1-e^{-t/T}) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (a)$$

where $\theta_m$ is the ultimate temperature rise and T the thermal time-constant of the body. Let the units of t and T be the time increment $\delta t$.

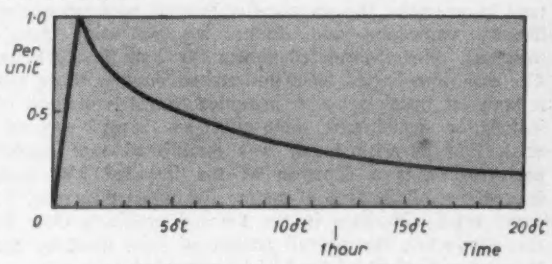



*Fig. 5. The basic temperature correction heating transient*

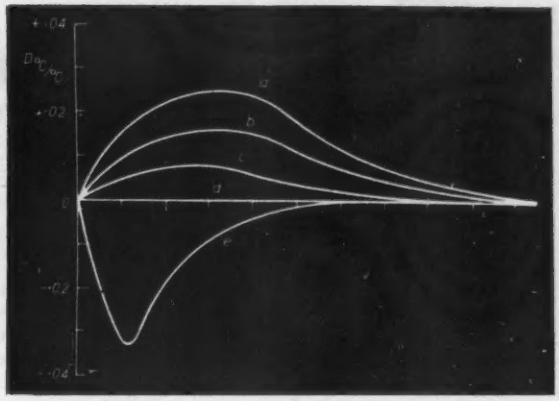



*Fig. 6. Dissipation correction heating transients. (a) 0 r.p.m. (b) 200 r.p.m. (c) 400 r.p.m. (d) 590 r.p.m.-standard (e) 1,200 r.p.m.*

At, for instance, time (2+x), the first transient, which rose to $\theta_m(1-e^{-1/T})$ and then decreased exponentially, became

$$\theta_1=\theta_m(1-e^{-1/T})e^{-(1+x)/T} \quad \ldots \quad \ldots \quad (b)$$

The second transient, similarly, became

$$\theta_2=\theta_m(1-e^{-1/T})e^{-x/T} \quad \ldots \quad \ldots \quad \ldots \quad (c)$$

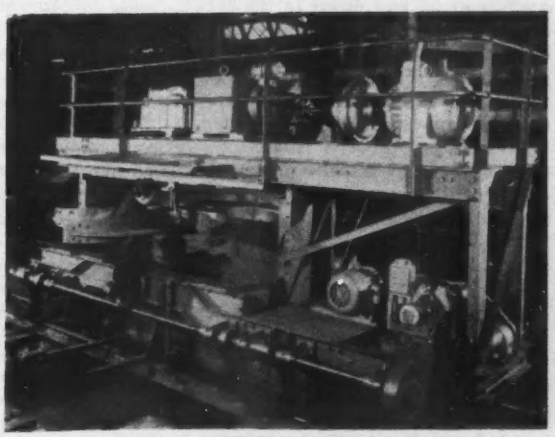
and the third, which is only relevant for time x, became

$$\theta_3=\theta_m(1-e^{-x/T}) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (d)$$

Adding equations (b), (c) and (d), will show their equality to (a) when t is (2+x), verifying the validity of superposition in this example.

# Feeding Coal to Richborough

TWO coal-handling 650 tons/hr paddle feeders have recently been supplied for the 360 MW power station now being constructed at Richborough, Kent. These feeders will be operated beneath a 90 ft long slot-discharge hopper located in the coal storage area. Normally, one feeder will act as standby but is arranged to run on the same rails and, should both feeders be operated together, the traversing facilities provided on each feeder will be restricted by limit switches. The paddle feeders, which were made by the GEC, are used to discharge coal on to the first of a series of conveyor belts which terminate at the station bunkers. Provision is made for speed variation of the paddles from 6 r.p.m. to 28 r.p.m. through gear reduction, and a fluid coupling between the motor and gearbox is fitted to give mechanical overload protection.



*One of the paddle feeders at Erith Works*

# Energy Requirements for Floor-warming

## ERA REPORTS ON SYSTEMS AND INSTALLATIONS

IT may come as a surprise to many who imagine that electrical floor-warming systems are of recent development to learn that the Electrical Research Association has been studying the subject for rather more than a decade. In the latest reports just released* the performance of actual early electric floor-warming installations are examined and the results of laboratory tests on directly embedded and ducted systems are described. Both include much that is now common knowledge, mainly by reason of the recent publication from the Heating and Ventilating Research Association, reviewed here on 18 May (page 803), in which reference to the reports is made.

### Early Installations

The first report deals with observations on practical off-peak floor-heating installations taken at intervals over a period from 1951 to 1956. The buildings include a multi-storey office block, the County Buildings, Cupar, Fifeshire; a school, St. Mungo's, Falkirk; and a prefabricated hut, all using ducted heating cable with expanded metal, and two other smaller installations using bare or insulated wire buried in concrete supplied from a low-voltage source. The tests were carried out under normal operating conditions during the winter months of the period, the thermostat settings being adjusted to provide comfortable conditions to suit the occupants with whom liaison was maintained. Spot measurements of temperature were taken from thermocouples attached to exposed walls, floors and ceilings for short-term tests or buried in the surface at an approximate depth of $\frac{1}{16}$ in. for long-term tests. Inside air temperatures were determined by thermocouples mounted in special fittings suspended from the ceilings and outside temperatures from similar thermocouples arranged inside Stevenson screens.

### Estimated Losses

In each case the estimated loss was determined in accordance with methods and using transmission coefficients as laid down in the IHVE *Guide to Current Practice*, and from this the electricity consumption was calculated on the basis of one air change/hr with a loss gradient of 35°F between inside and outside air temperatures. The allowances for ground floor loss were those used for conventional heating systems.

Comparison between the electricity consumptions as calculated and as actually measured showed that the basis of calculation gave figures that were, generally speaking, considerably higher than experienced. For ground floor rooms with only one or two outside walls, actual consumption was about half of that calculated. For single-storey structures with three or four outside walls the corresponding proportions were 82% and 106%. Minor variations from these figures were noted for different periods of the year and for varying degrees of occupancy but, on the whole, the effects of occupancy and ventilation in well-occupied rooms, such as school classrooms, appeared to compensate for each other.

It was therefore concluded that the calculated figures did not make sufficient allowances for ventilation, solar gain and temperature rise from the human metabolism—the former being over-estimated and the two latter under-estimated—and, in addition, allowances for heat transfer between spaces were also inadequate. As a result, installations which, on paper, seemed to be inadequate for comfortable heating gave satisfactory environments in practice, while those which were generously designed were prevented from giving excessively heated conditions by the thermostatic control.

Working back from this, correction factors have been devised which, applied to the calculated figures, give results which are close to those which will be achieved.

### Correction Factors

Assuming a floor-heating system operating 12 hr/day, the factors upon which the electrical loadings are based should be as follows:

(1) for sheltered ground floor rooms with one or two outside walls .. .. .. Calculated loss × 1·2

(2) for large rooms with three outside walls and lower floors of multi-storey blocks Calculated loss × 1·5

(3) Intermediate and top floors of multi-storey blocks .. .. .. .. Calculated loss × 1·7

(4) isolated high buildings .. .. Calculated loss × 2·0

Where supply is available for more than 12 hr each day, these loadings may be reduced.

The day-to-day electricity consumption is significantly affected by the previous day's external temperature and also its solar gain, but the inside temperature is not significantly affected by solar gain, probably because of compensating night radiation. The report gives some idea of the annual consumption/kW of installed load for different types of structure, which averages out at about 1,400 units/kW/annum, and is supplemented by a number of appendixes and graphs.

### Comparison of Systems

The second report summarises a series of laboratory tests to determine the comparative thermal performance of directly embedded and ducted systems using metal-sheathed, mineral-insulated cables for both installations. The experiments had been undertaken because there was a body of opinion which imagined that the method of installation would have some effect on thermal performance. Not surprisingly, it was established that overall performance is a function of the installed kW load, irrespective of the type of system for, while there may be some small difference in the thermal gradients close to the conductor, the overall output of heat must be the thermal equivalent of the kW hr expended.

* Tech. Report Y/T26 "Performance of Electric Floor-Heating Installations." Price 28s; Tech. Report Y/T27 "Comparative Performance of Directly Embedded and Ducted Electric Floor-Heating Systems." Price 10s 6d. Electrical Research Association, Leatherhead, Surrey.

# H.V. bundle conductor systems

by Prof T. V. Sreenivasan, B.E., M.Sc.(Tech.), A.M.I.E.(Ind.)*

BUNDLE or multiple conductor systems, that is three-phase systems with more than one conductor per phase, uniformly arranged around the circumference of a circle, are being increasingly used for overhead lines when the voltage exceeds 220 kV. In the dual, or duplex, conductor systems there are two conductors per phase, spaced 25 cm to 50 cm apart. Similarly, there are three and four conductor systems. The necessity for such systems arises because e.h.v. lines require large diameter, or "expanded," conductors to limit corona loss and radio interference. To meet these requirements, conductor surface potential gradient must be limited to about 15·5 kV r.m.s./cm. This means that a 330 kV, three-phase system would require a conductor of more than 3·5 cm diameter. Such large conductors are not easily available and are also difficult to handle. To get over this difficulty, bundle conductor systems are used. Dual conductor systems for e.h.v. a.c. lines are being used in the USSR and a three conductor is also being used for d.c. ±400 kV lines. Germany has a four conductor bundle for 380 kV a.c. lines while Sweden, France and Great Britain are using two conductors per phase for their e.h.v. lines. There are also bundle conductor systems in other parts of the world.

## Effect of Bundled Conductors

Use of bundled conductors results in reduction of reactance, but an increase in line capacitance. For the purposes of calculating reactance and capacitance, the equivalent radius, $r_e$, of a bundle conductor may be taken as $\sqrt{(s.r.)}$ if there are two conductors per phase; $\sqrt[3]{(s^2r)}$, for three conductors per phase; and $\sqrt[4]{(\sqrt{2}.s^3r)}$, for four conductors per phase, where "s" is the spacing between, and "r" the radius of, the sub-conductors. With this equivalent radius, $r_e$, the same formulae used for the calculation of reactance and capacitance for single conductor systems can also be used for the bundle conductor systems.

Since s is usually between 25 cm and 50 cm, it is obvious that the reactance would be considerably less and the capacitance considerably greater in the case of the bundle conductor system than in the case of the equivalent single conductor, that is, a system with one conductor per phase whose cross-section is equal to the total conductor cross-section per phase of the bundle conductor system.

## Surface Gradient With Bundled Conductors

Fig. 1 shows the equipotential lines in the case of three and four conductor systems.

Even though the phase capacitance is increased, the charge per sub-conductor is decreased for all practical spacings of the conductors. This reduction in charge per conductor is so great that the surface gradient for a bundle conductor system is less than for the equivalent single conductor system, in spite of the lesser radius of the sub-conductors. Due to the proximity of the other conductors in the bundle, the charge centre of each sub-conductor is shifted, increasing the gradient on the outer surface and decreasing it on the inner. This effect is accentuated by the field of the other conductors in the bundle. Thus the surface gradient is not uniform round

* The Author is Professor of Electrical Engineering at the Naval College of Engineering, Lonavla, Maharashtra State.

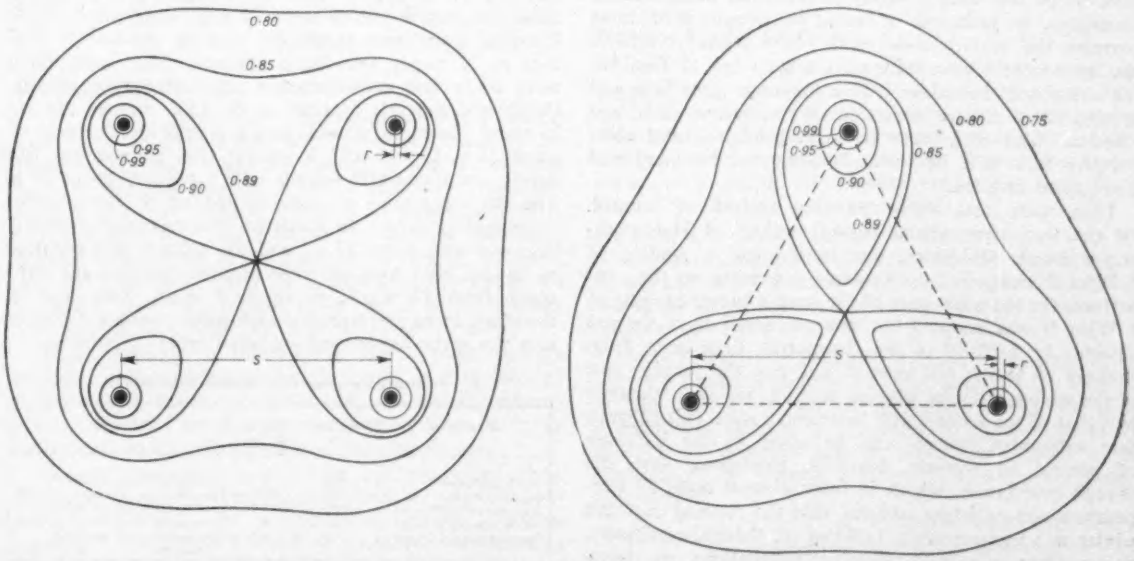



*Fig. 1. Plot of per unit equipotential lines for three and four conductor bundle systems; "s" is the conductor spacings in the bundle and "r" their radius*

each sub-conductor. Spacing of the sub-conductors affects the field in two ways: Increasing the conductor spacing tends to increase the charge per sub-conductor and so increase the surface gradient. But increasing the sub-conductor spacing also reduces the proximity effect. Reduction of the proximity effect lessens the extent to which the centre of charge on each conductor is shifted and hence lessens the surface gradient and the contribution of the charges on other conductors in the bundle to increasing the surface gradient.

Hence at a certain spacing, the maximum surface gradient will have a minimum value. But the curve, maximum surface gradient versus spacing of subconductors, is fairly flat over the practical range of spacing variation, so that in practice the spacing used is a little more than the theoretical optimum spacing as far as surface gradient is concerned, to derive the benefit of reduced reactance, since this is continually reduced as spacing is increased. For practical lines, the voltage gain obtained by adopting the bundle conductor system is about 7% with the two conductor system, 16% with three-conductors, and about 25% with the four-conductor system.

## Technical Considerations

As the span is usually about 300 metres, the bundle conductor system will require spacers at intervals of about 100 metres to keep the sub-conductors apart. In the majority of cases these spacers have not given any trouble. The bundle conductor transmission line would be 5% to 10% more costly than the equivalent single conductor transmission line since it is subject to heavier wind and ice loads, requires wider and taller towers, more complicated and expensive hardware and higher stringing charges. It is less subjected to aeolian vibrations and swings out less from the vertical when subjected to wind forces.

The bundle conductor system, due to its lesser line reactance, requires fewer corrective voltamperes than the equivalent single conductor system. Its transmission capability, as determined by the steady state stability limit, is also higher and in the case of long distance transmission, this is a very important advantage which far outweighs all the disadvantages. Even for voltages less than 220 kV, it has been found worth while on some existing transmission lines to convert them to dual conductor systems to increase the transmission capability without increasing expenditure for extra way-leave. As the way-leave costs increase, more and more existing transmission lines, in the voltage class 66 kV to 220 kV, may be expected to be converted into dual conductor systems, to increase their transmission capability without additional way-leave charges.

### REFERENCES:


1. Potential, Potential Gradient and Evaluation of Corona loss in Dual Conductor Transmission Lines. T. V. Sreenivasan. *Journal of the Institution of Engineers (India)*, Pt. 2. August, 1960.
2. Electrical 330 kV Transmission Characteristics and Long Terms Prospects in the USSR. I. L. Griuntal and A. N. Sherentis. *Electric Technology USSR*. Vol. 3. July, 1960.
3. Economics of Single and Bundle Conductors for e.h.v. Transmission. P. A. Abetti, C. B. Lindh, H. O. Simmons, Jr. *Power Apparatus and Systems*. June, 1960.
4. Bundelleitungen. Von F. Busemann and W. V. Mangoldt. BIOS Report 1833 (HMSO).
5. Electrical Characteristics of Overhead Lines. S. Butterworth. ERA.


# Electricity in Road Safety

ELECTRIC heating of roads for the prevention of ice formation and for melting snow is now becoming an accepted practice, and in the report on Road Research, 1960, reference is made to some of the experimental work undertaken. In the case of the Hook underpass, which was used to study performance under shaded conditions, the technique of laying was simplified to direct covering the heating cables with rolled asphalt. Grooves cast in concrete were adopted for a bridge at Basildon for containing the cables before the wearing surface was applied. Part of the underside of the bridge deck was insulated with cork slabs for heat insulation and comparative tests will be made between the insulated and uninsulated sections.

Tests were also made on the method of control. Of the two experimental heated sections at Harmondsworth Road, Middlesex, one section had a loading of 5 W/sq ft controlled by a simple thermostat in the road surface. On the other part of the road a higher loading of 8 W/sq ft was adopted but was controlled by a wetness detector in addition to the thermostat. Experience from January to March last year showed that the running cost of the section with the wetness detector was approximately half that of the section with thermostat only. This suggests that substantial savings can be made by the inclusion of control by wetness detectors. Experience with the Slough installation, which includes control both by temperature and moisture, showed that the running cost last winter was approximately 1s 6d/sq yd, though, admittedly, the weather was mild. Heating installations are being designed for the Hangar Lane underpass, the new Clyde tunnel approaches and Hyde Park Corner underpass on which the Road Research Laboratory are advising.

In an entirely different field, experiments have been made with a view to reducing the severity of accidents resulting from impact with street lighting columns, a cause which gave rise to some 90 fatal accidents in 1958. Practical tests were made by running pre-war 8 h.p. cars at 22 m.p.h. into lamp columns. High-speed films were taken and decelerometers attached to the chassis. Prestressed concrete columns to BS 1308 stopped the car in about one-tenth second, giving a peak deceleration of some 33 g. Impact with a tubular steel column was less severe, about one-fifth second, with a peak of about 19 g. The thin sheet-steel column showed up as far superior in preventing dangerous accidents. The maximum deceleration was only some 12 g., and the column was reported as having been torn off underground, reducing the car's speed from 22 m.p.h. to about 8 m.p.h. This type is, therefore, to be preferred for high-speed roads, but further tests are to be carried out on other types of columns.

**Particulars of some road heating installations**

| Installation | Total load kW | W per sq ft | Remarks |
|---|---|---|---|
| Hook Underpass | 375 | 9 | Asphalt direct on cables |
| Basildon Bridge | 40 | 15 | Cast concrete grooves for cables |
| Hammersmith Flyover | 1700 | 9-14 | Loading depends on position |
| Harmondsworth Road | — | 5 | Thermostat on surface |
| Harmondsworth Road | — | 8 | Thermostat plus wetness detector |

# Readers Views

*Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor*

## Safety in Electric Gardening Tools

I AM concerned at the recent article by Mr J. Mellanby suggesting the use of electrical appliances in a garden connected direct to 240 V supply (using earth leakage circuit-breaker protection). He rightly points out the importance of wiring being properly installed, but makes no reference to flexible cable connections to appliances; these, in my opinion, could present shock risks under certain fault conditions. Three-core, tough, rubber-sheathed cable, however strong, durable or well-insulated, is prone to damage, e.g., by sharp tools such as secateurs, lawn-edging knives, shears or garden forks.

In certain cases, under some fault conditions and depending upon the resistance of the earth path, if accidental contact with a "live" conductor only were inadvertently made through a person working in a garden, the resulting shock at 240 V might well prove fatal. The advantages of the use of low-voltage power-driven garden-tools by users inexperienced in electrical theory cannot be stressed too strongly.

If vacuum cleaners, radiograms, fairy lights and kettles are used in gardens on the system as described in the article, problems of the plugs on the appliances not fitting the socket-outlets in the garden might well occur in some cases and users will resort to improvisation by using adaptors. The types of flexible cable found on most fairy light sets and radiograms would afford serious shock risks if used carelessly outside. References such as "must" and "complete safety" are better applied to the use of 110 V for outside use, rather than to 240 V. Quote from HM Memorandum on Electricity Regulations, Form 928, Fourth Edition, 1951, page 42: "If these recommendations to reduce voltage for portable lamps and portable tools were universally adopted the fatal accidents due to electricity might easily be halved."

If the author agrees to include a 240 V/110 V step-down transformer, I think the system as described an excellent idea.

*John Crisp,*
CROXLEY GREEN, HERTS.

## Off-peak Heating

MY own observation of direct heating loads agree to some extent with the claims made by Mr Hazel (ELECTRICAL TIMES, 24 August). I believe, however, that the building thermal capacity affects the maximum demand and may improve the case for direct heating.

The reason for the relationship between maximum demand and thermal capacity of the building is, I believe, that the "flywheel" effect of a structure may cause the immediate heat requirement to be equal to the average heat loss (or very nearly so) over a number of days.

Where heating is intermittent, the cooling of the structure during unheated periods results in a pre-heating demand. The extent by which this pre-heating demand exceeds the load required at supply peak hours is partly determined by the allowance made on the net load.

Since it is necessary to have the building heated ready for occupation, the load characteristic of certain consumers who may be contemplating electric heating (especially commercial) could be improved considerably where direct heating is preferred to storage methods.

Consumers classification for tariffs makes some direct heating systems uneconomical to operate, whilst an "off-peak" system may have a high daily mean temperature. The "plum" is then left for a competitive fuel!

*W. H. Tibbs,*
ALWOODLEY,
LEEDS 17.

## Inspection of Installations

IT is indeed good to see that yet another supply authority is about to introduce the inspection scheme for older installations. It is something about which friends of mine and myself have often written to E.T. One feels that the fatality hazard of the older installation, the one which has been extended until it bears no resemblance to the original installation and yet retains the same feeders carrying the added load, is a very serious one. It is necessary to point out the difference between this proposed scheme and the system of testing a new installation which has been in operation over many years. A new installation is not normally connected until it has been tested and thoroughly examined and the fact established that all regulations and precautions have been observed. In the installation inspection scheme, as I see it, the consumer, who is responsible for his own installation, may apply to the board for his installation to be tested and when this is done recommendations as to the work necessary to put the installation into order will be given, and then it will be up to the consumer whether he has the work carried out or not. One supposes that if an installation is found to be "a possible danger" to other consumers, that is, that it may cause interruption or annoyance to other consumers, it may still be disconnected but, as we know full well, this procedure has rarely been carried out.

*J. A. Hill,*
BROMBOROUGH.

## Motor Control Settings

THE note published in "Problems and Practice" over the initials J.C.F. in your 24 August issue displays a common failing of electricians in their knowledge of the principles of protection of electrical equipment. Your correspondent says that when extra load is added to a circuit the breaker controlling that circuit should have its trip setting increased.

This is not correct; the breaker is there to protect the wiring and equipment beyond it and the current setting should not be exceeded. If it is to be exceeded, the circuit wiring should be replaced by larger wires or a sub-circuit breaker introduced.

If the problem he mentioned was due to starting current only the correct action would be to increase the time lag of the trips to prevent tripping during start up. This is commonly effected by using heavier dashpot oil in the case of oil dashpots without adjustable orifices or by replacement of thermal units with ones having longer time delays.

*A. A. Siddall,* GRADUATE I.E.E.,
COWLEY,
UXBRIDGE.

# Energy from wind and sun

## Rome conference of U.N.

OVER 250 papers were contributed for the United Nations conference on New Sources of Energy which ends today in Rome. Some may question the title of the conference, for while the utilisation techniques for the sources may be new, the sources themselves, the sun, wind and geothermal sites are just about as old as they can be.

The objectives of the conference were to consider how solar energy, wind power and geothermal energy could be more widely used, particularly by the under-developed countries and in those countries where conventional energy resources are lacking or their cost is high. The theme of the conference was essentially practical, with prominence given to methods of utilisation and cost. During the conference, representatives were able to visit the Larderello geothermal installation and, in a field outside Rome, a 1½ kW generator, energised by the sun, was demonstrated driving an electric motor for a well pump. The generator was invented by Dr H. Tabor, of the Israel National Physical Laboratory, and was experimental. The sun's rays were used to heat water passed through pipes inside long plastics cylinders, inflated to keep them rigid. The sun's radiation formed a mixture of water and steam and this was passed through a heat-exchanger, where the heat was transferred to chlorobenzine. The second fluid vaporised and was used to drive a small turbine and generator.

### Wind Generation

Papers dealing with study of wind behaviour and the investigation of sites suitable for wind-driven plants were reviewed in the general report by Mr E. W. Golding, of ERA. He first drew the distinction between generation by wind power and every other energy source, including solar radiation, that neither the performance of a wind plant, as indicated by its efficiency as a power unit, nor its annual output of energy could easily be measured. Of necessity, the output of a wind machine is continually fluctuating, while its annual output is strongly influenced by the precise location of the installation, even though general values of the annual wind speed may be known. Five of the papers presented at the session dealt with the meteorological data for winds in various parts of the world, four with wind-measuring instruments and four gave guidance on the selection of suitable sites for wind generators. The output of a wind-driven generator is proportional to the integral of the cube of wind speed with respect to time, the constant of proportionality depending on the efficiency of the machine, the area swept by its rotor and air density.

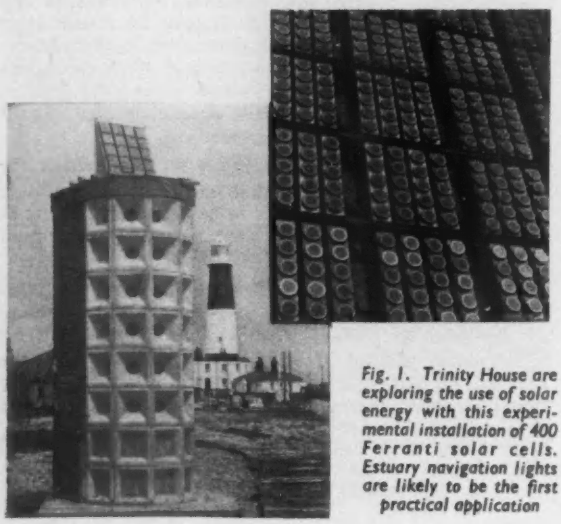


*Fig. 1. Trinity House are exploring the use of solar energy with this experimental installation of 400 Ferranti solar cells. Estuary navigation lights are likely to be the first practical application*

*Fig. 2. Developed in conjunction with the ERA, this wind-driven generator built by R. Smith (Horley), is rated 100 kW. An induction generator is driven through 10 : 1 step-up gearing by the 50 ft diameter rotor. The three blades are of fixed pitch, made of extended aluminium with orientation by the fan tail. The machine has recently been modified and is shortly to be re-erected. The plant has operated in parallel with the Isle of Man supply network and has produced 120 kW in a 45 m.p.h. wind.*

### 200 kW Danish Unit

French engineers have developed and used instruments in their surveys for measuring the energy available in the wind and sun, but they do not measure the power obtained from the actual machine, since it may have operating limits, such as wind speed, which restrict its utilisation of the energy available. Dealing with the various types of instruments developed for wind surveying, the author referred to new instruments developed for tests associated with the Danish 200 kW wind generator at Gedser which measure wind energy distribution between different ranges of wind speed and the maximum velocity pressures of the wind. A comprehensive study of wind flow over the hills was presented in a paper by Frienkel. A very important aspect of his investigation was the study of mean wind vertical gradient and how it was affected by topography.

He showed that for any particular wind direction this gradient was independent of the wind strength within the normal operating range of wind power plant.

Measurement of wind speeds over very short periods required instruments with rapid response to give accurate recording of gusts. A high wind speed which lasted for only a fraction of a second might have little influence on the machine, but durations slightly longer might increase the electrical output or induce high mechanical stresses in the rotor blades.

## Wind Power Utilisation

Papers dealing with the design and testing of wind power plants were summarised by Dr L. Vadot. He drew attention to the two dominating facts of wind power utilisation, the great dilution of the energy in space and its considerable and unpredictable irregularity. Only just over half the kinetic energy in a current of air was theoretically recoverable and this was further reduced by the generator efficiency, which might be between 50% and 80%. The importance of design and construction cost if wind power was to be competitive was illustrated by the annual available energy output which might vary from 100 kWh/m² of swept area to 500 kWh/m² in windy areas. Wind speeds of five times the mean design wind speed were not uncommon and under these conditions stresses on the fixed structure increased 25 times and the power available in the air current rose to 125 times the designed value. Although wind power plant was well developed, it was not yet competitive, in general, with other sources of energy. Some of the problems to be overcome were adaptation of wind plant features to wind conditions and types of use, selection of optimum sizes of generating units, either singly or in groups, and application of new materials, especially plastics, in their construction.

The designer of wind plant was faced with a number of problems of which the principal were: economy imposed by the extreme dilution of wind power and the consequently relatively large rotor required, the strong design of rotor blades necessary to withstand stresses of turbulence and cyclic variations of stress, systems of blanking out the blades, necessary because of the difference between rated wind speed and the maximum likely to be experienced in a storm. Speed control was also of great importance. Nearly all possible machines for converting wind into mechanical energy had been tried out, and these could be grouped into those with rotor axis perpendicular to the wind direction and those with the axis oriented into the wind.

In the first group were vertical axis machines, and while these have the advantage of not needing an orienting mechanism, they had several disadvantages, of which the principal was that they could only recover a small amount of the energy passing the swept surface. Machines with the axis parallel to the wind were the only types considered practical today. The ratio of peripheral speed to wind speed, or the tip-speed ratio, could now be as high as 10. Higher ratios were unlikely to prove worth while since they required elaborate techniques to produce them. A high tip-speed ratio would generally be used, although one disadvantage was the loss of starting torque, with increase in the ratio. On the other hand, the cost of step-up gearing was reduced. Whether two, three or more blades should be used was still not agreed, but the design of blades had benefited from aerodynamic research, and increasing use was being made of plastics, particularly glass-reinforced, in their construction. In Germany a 100 kW generator was operating; in France, a 150 kW generator was working, and several smaller machines had been built for generation and pumping. In the smaller machines, all-plastics blades had given excellent results.

A regulating system was required to control speed and to regulate power output or control blade stress. These objectives might be obtained by a technique similar to the variable-pitch propeller used for aircraft or the blades could be controlled, either by springs or by blinds. Again, a regulating governor might disconnect the system at a predetermined wind speed, as in the Danish plant at Gedser. For generation, the exchange of magnetising current with the network automatically maintained constant speed, so that the regulator was only required to limit power output at high wind speeds.

## Surveying For Sites

An important aspect of testing was to obtain a series of curves for power output and different wind speeds. A wattmeter and standard anemometer had been used by some workers, while others measured the energy output and mean wind speed over a period of a few minutes. A paper by Argand described a quick response anemometer suitable for measuring rapid changes in both wind speed and direction. Measurements specifically for wind generation should be used with the general meteorological information available for the district. Such information suggested areas for wind surveys, indicated direction of prevailing winds and was useful from other aspects. In surveying for an actual site, the first object was to discover especially windy points at which the plant could be installed. First considerations were therefore topographical, but a secondary point was the proximity of access roads, buildings and habitation, where the energy generated could be used. It was well known that wind speed increased with height above level ground, but inland hills might not necessarily prove good sites if there was other high ground in their vicinity, or if broken ground induced high turbulence. On the other hand, very significant increases in wind speed could be obtained if a hill was chosen with a profile which caused it to act as an aerofoil, accelerating the wind over its summit.

The great difficulty of utilising wind power was to absorb fluctuations over intervals ranging from ½ hr to

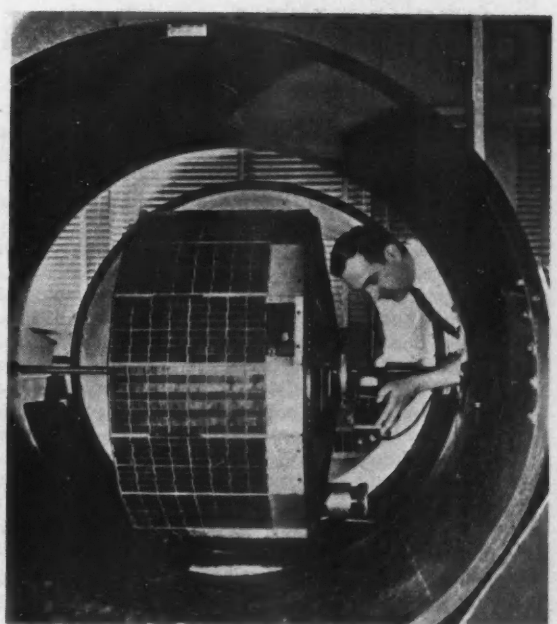


*Fig. 3. Another application of solar cells, the assembly on the Tiros I satellite. Similar cells are available from International Rectifiers*

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For larger generators in the MW region, a lower price was essential and a different type of collector needed to be evolved. MW units had a number of drawbacks compared with kW units. They would involve a transmission system, storage facilities, and a heavy maintenance cost might be imposed due to the size of the collector needed. On the other hand, they had an advantage in the turbine unit, since small steam plants were very inefficient and it would be necessary to use a high molecular weight fluid to obtain comparable thermal efficiencies from a plant generating only in the kW range. Efficiencies might be 15% to 20% for a 2 kW to 10 kW unit. Increase in temperature required a much more complex collector system, whereas for temperatures below 100°C stationary non-focusing collectors could be used. If the operating temperature was raised to between 100°C to 200°C, focusing collectors were required, with provision for tilting them to follow seasonal variations. For higher operating temperatures the expensive complication of a sun-tracking mechanism would be required and a more complicated mirror structure.

Dr Tabor says that not too much progress had been made in the development of suitable solar collectors for plant in the kW range. Here, some form of focusing collector with seasonal tilting facilities, but preferably without the complication of sun-tracking mechanisms, was needed. In the MW region the horizontal non-focusing system was likely to be the only form feasible. One suggestion was for a flat plate collector floating on the sea providing hot water for a low temperature turbine with the sea acting as the cold sink. Another proposed system for electrical generation and distilled water production, utilised a shallow depth of water about 1 sq mile in area covered by a plastics film. A third scheme suggested the use of a black-bottomed pond with shallow water, convection of the water being suppressed by using appropriate salt concentrations. The water would then act as a good thermal insulator and temperatures up to 90°C were reported to have been obtained. The heat would be extracted from the bottom of the pond.

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The line has been constructed in West Virginia on the site of a possible future power station, Apple Grove. It is energised through a 138/750 autotransformer via a 750 kV bus structure. To permit independent tests on all of the three-line sections for radio interference, blocking filters are installed at the intersections so as to minimise interaction of noise generated.

For the operation of the line under test, phantom loading is adopted; in addition to being energised at 750 kV, the conductors are separately loaded. For this purpose the four conductors in each phase bundle are insulated from each other and connected in series. A current is then circulated through the four conductors of each phase by means of a transformer at the station end, the requisite loading is obtained through the use of a series capacitor with each transformer. The current circulated is equivalent to a load of 1,000 MVA on each line.

The instrumentation is considerable and includes automatic data logging equipment using magnetic tape. This will record various climatic and other quantities, in all about 50, with readings taken every 20 min. Where, however, the reading falls outside predetermined limits, the data logging will be accelerated to every 2 min.

For radio interference measurement, instrument houses, six in all, have been erected at 100 ft and 200 ft from the centre phase at the midpoint of each of three lines. Different types of metering are provided for each group, based on three different theories of r.i. characteristics. For measuring corona loss, wattmeters are fitted in each phase on the three test lines. As this measuring equipment has to be mounted in a situation of high potential, an ultrasonic beam is used to provide a link with the data logging equipment at ground level.

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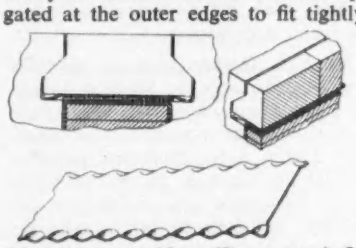

*A novel form of slot wedge for rotary machines*

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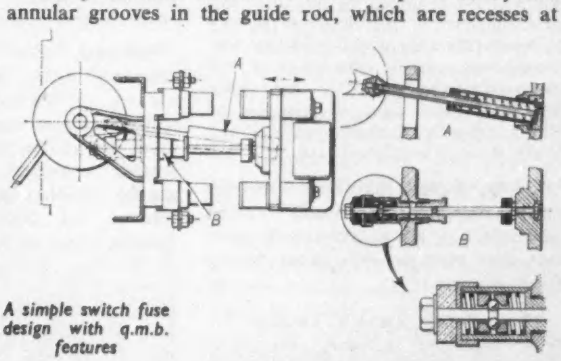


*A simple switch fuse design with q.m.b. features*

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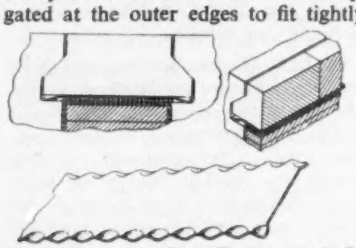

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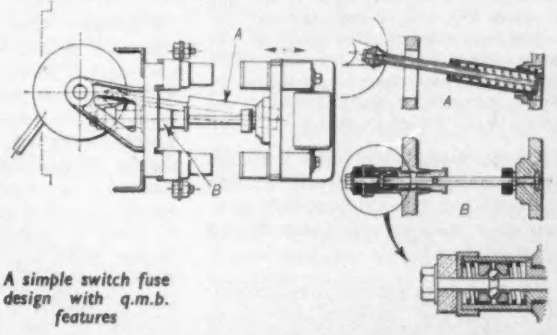


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# Personalities *in the industry*

*Mr T. Coates*

*Mr R. Turner*

*Mr G. W. Rufford*

*Mr J. A. Dunbar*

*Mr E. G. Taylor*

A former deputy chairman of the North Western Electricity Board, **Mr T. Coates,** M.ENG., M.I.E.E., M.I.MECH.E., has joined J. Gerrard and Sons Ltd., building and civil engineering contractors, of Swinton, Lancs. He is to be managing director, with effect from 4 Dec. next. In the meantime he will act as general manager. It will be recalled that Mr Coates left the North Western Board to become the first general manager of the Egg Marketing Board at the beginning of this year. But he resigned from that post at the end of April following a disagreement. Mr. Coates was deputy chairman of the North Western Board for five years, following seven years as manager of No. 3 sub-area of the Merseyside and North Wales Electricity Board.

**Mr D. Hobson** has been appointed sales manager of the Furnace Division of Hedin Ltd. He was previously assistant sales manager with Salem Brosius (England) Ltd.

**Mr R. Turner,** A.M.I.E.E., A.M.B.I.M., has been appointed sub-area commercial officer of the York sub-area of the North Eastern Electricity Board and will take up his duties on 1 Sept. He succeeds **Mr C. Wilkins,** A.M.I.E.E., who has held the position of sub-area commercial officer at York since vesting day. From 1924 to nationalisation, Mr Wilkins held various appointments with the North Eastern Electric Supply Co. Ltd. Mr Wilkins retires from the Board's service on 10 Sept., 1961 (*ESH, page 154). He was the recipient of a presentation recently by **Mr T. Duerden,** sub-area manager, on behalf of the staff. Mr Turner received his technical education at the Burnley Municipal College and the Salford Royal Technical College. He has held appointments with the Cardiff RDC Electricity Department, the South Wales Electricity Board, the North Western Elecricity Board and is at present senior assistant engineer (commercial) with the No. 6 (Hull) sub-area of the Yorkshire Electricity Board. From 1943 to 1946 he served as an Electrical Lieutenant in the RNVR.

**Mr J. Wilson,** engineer, electrical development, to the New South Wales Electricity Commission, is now in this country on long-service leave, during which he plans to make investigations into matters related to system design and future prospects of e.h.t. transmission.

Previously with the East Midlands Electricity Board, **Mr G. W. Rufford,** A.M.I.E.E., is joining the Eastern Electricity Board as engineer of the North Essex district. He will succeed **Mr I. A. Lauder,** ASSOCIATE I.E.E., who retires shortly (*ESH, page 107). Mr Rufford received his technical education at Ipswich School of Technology and served a five-year apprenticeship with the former Ipswich Corporation Electricity Department. Subsequently, he had experience at Ealing, Heston and Isleworth districts of the Southern Electricity Board and rejoined the Eastern Electricity Board as second assistant engineer, Woodbridge district, in June, 1951. In 1954 he moved to the Operation and Maintenance Section of the Chilterns sub-area headquarters before joining the East Midlands Board in 1959 in his present appointment of second assistant engineer in the technical and substation construction department of the Ilkeston and North Derbyshire sub-area headquarters.

**The Earl of Verulam** has been appointed chairman of Delta-Enfield Rolled Metals Ltd. **Mr C. C. Millar** has been appointed vice-chairman and **Mr A. Lane** becomes managing director. Other directors are **Mr W. W. Dolton, Mr S. Powell** and **Mr W. J. Vaughton. Mr W. W. Rigg** is company secretary. The company was formed earlier this year when Enfield Rolling Mills and the Delta Metal Co. merged their rolled copper and brass sheet and strip interests.

**Mr J. A. Dunbar,** A.M.I.E.E., has been appointed manager for Scotland for the Aberdare group of companies. He will control sales promotion for the Aberdare group in Scotland, and will also operate the Scottish factory of South Wales Switchgear Ltd. at Glasgow. Mr Dunbar was formerly senior sales engineer of the Instrumentation Division of the AEI at Trafford Pk, and previously superintendent of the AEI, London Meter Department.

Following the Plessey company's recent acquisition of Semiconductors Ltd., the board of directors of the latter concern has been reconstituted as follows: **Sir Allen Clark** (chairman), **Mr John A. Clark, Dr J. Reekie, Mr D. H. Roberts, Mr G. C. Gaut** and **Mr G. Campbell.**

Manager of GEC's north west area for the past three years, **Mr E. G. Taylor,** M.I.E.E., F.I.E.S., will henceforth be assigned to a special duty of "wholesale liaison" in the north of England, under the new distribution system of the Electrical Installation Group, to which we refer on page 310. Although attached to group headquarters, Mr Taylor will operate from Manchester. He has been with GEC for 48 years and has worked in the north west since 1930. A graduate of Birmingham University, he served an apprenticeship at the Witton engineering works, which was followed by a year in the Estimating and Contracts Dept. From 1922 to 1924 he was technical assistant at the company's Liverpool office and then was branch engineer at Swansea for six years. He became branch engineer at Liverpool in 1930, and at Manchester,

**Denotes revision to the "Electricity Supply Handbook, 1961."*

additionally, in 1939. After the war he was appointed manager, industrial sales, at the Manchester branch, became assistant district manager for the north west area in 1954, and was promoted to manager of the area in 1958. Mr Taylor was chairman of the IEE, Mersey and N. Wales Centre in 1941-42, and served on the Council of the Institution from 1941 to 1944. He was a member of the Anglo-American Materials Handling Productivity team in 1949, and since 1951 has been local honorary secretary of the IEE Benevolent Fund, North Western Centre.

**Mr R. H. Dent,** deputy chairman and managing director of the Cape Asbestos Co. Ltd., has been elected chairman of the company's subsidiary, Cape Insulation and Asbestos Products Ltd. **Mr A. T. Mendelle** has been appointed plant manager of CIAP's factory at Hart's La, Barking, of which **Mr A. A. Cross** has relinquished his responsibilities as general manager. **Mr A. G. Grant,** managing director of CIAP, has been elected chairman of Andersons Insulation Co. Ltd.

Chairman of the Planning Group of the State Electricity Commission of Victoria since 1952, **Mr W. B. Nelson** has retired after 36 years' service with the Commission. He was closely associated with the research into the utilisation of the Yallourn brown coal in power generation.

**Mr L. G. Clifford** has been appointed a director of Drake and Gorham (Contractors) Ltd. He joined the company in 1948, managing the Winchester branch, and subsequently the Newcastle and Manchester offices. The activities of the latter branch will continue under Mr Clifford's direct control. Earlier he served an apprenticeship at Croydon power station and after qualifying, took a commission as an electrical officer in the Royal Navy during the latter years of the war. From 1946 to 1948 he was with the Ministry of Works.

Formerly with the Yorkshire Electricity Board, **Mr J. K. Dent,** M.I.E.E., A.M.B.I.M., has joined the headquarters staff of the CEGB as principal assistant engineer, Commercial Department. Educated at Newton Abbot Grammar School and Rugby College of Technology, he served an engineering apprenticeship with the BTH Co., and, after a period developing new production plant for magnetrons, entered the electricity supply industry in 1945. Since 1956 he has been senior assistant engineer (distribution design) in the Sheffield sub-area of the YEB, where he is succeeded by **Mr K. V. A. Lilley,** as we reported on 17 August (on that occasion we unfortunately mis-spelt the name of Mr Dent). Until leaving Sheffield for London, Mr Dent was hon. secretary of the IEE Sheffield sub-centre.

After nearly 50 years in the electrical industry, **Mr A. E. Watts,** manager since 1941 of the Birmingham branch of Allen West and Co. Ltd., retires today, 31 Aug. He will be succeeded by **Mr T. J. Ollis,** who was for more than 20 years at the Allen West Manchester office before being appointed deputy to Mr Watts at Birmingham in 1958. Joining the company in 1923, Mr Ollis had works, drawing office and head office estimating experience before going to Manchester in 1935 as sales engineer. Mr Watts served his apprenticeship with the Igranic Electric Co., and gained further experience with Crompton and Co., the Electrical Apparatus Co., and Metropolitan-Vickers Electrical Co., before joining the Allen West organisation in 1923 as an estimator. From 1936 until his appointment to Birmingham he was a sales engineer at the London office.

Sales manager of Preformed Line Products (Gt. Britain) Ltd., **Mr J. N. Roberts** leaves on 18 Sept. on a four-week business visit to Finland, Sweden, Norway and Denmark.

Patentee of the Gregg universal ceiling-rose, **Mr W. G. D. Gregg** is to be chairman of the Association of Supervising Electrical Engineers for the 1961-62 session. He is now chief engineer with Ed. R. Buck and Sons Ltd. of Manchester, with whom he has worked for 30 years. Educated at Birmingham and Manchester, he served an electrical and mechanical engineering apprenticeship with Crossley Motors Ltd. He also studied machine drawing and design in addition to factory layout and planning. Subsequently he was responsible for factory modernisation schemes. Mr Gregg joined the ASEE in 1939 and was chairman of the Stockport branch for one year and of the Manchester branch for four years. He has also served on the Northern Regional Council and the Organisation Committee.

Previously with Creda, **Mr L. J. Burrows** has joined Sunbeam Electric Ltd. as area representative for the Eastern Counties and Oxfordshire.

Director of research to AEI (Rugby) Ltd., **Mr L. J. Davies,** C.B.E., M.A., B.SC.(OXON.), M.I.E.E., F.I.E.S., has now been appointed director of research to Associated Electrical Industries Ltd. He is succeeded in the former position by **Dr J. E. Stanworth,** M.SC.(TECH.), F.R.I.C., F.INST.P. This new appointment is aimed at ensuring a coherent research effort by the company and making the most effective use of the resources and scientific ability in its various laboratories. Mr Davies becomes responsible for the direct supervision of the four AEI research establishments at Aldermaston, Harlow, Manchester and Rugby. He also becomes a non-executive director of AEI (Rugby) Ltd. Mr Davies joined BTH in 1924, and for the past 16 years has been director of research of what is now AEI (Rugby) Ltd. Dr Stanworth joined BTH as a glass technologist in 1937, and eventually lead a team on glass structure in the research lab. and in the Glass Works of the company. He subsequently took over wider research including new materials and their applications.

**Mr R. T. Gladwell** has been appointed industry group manager for Aircraft-Marine Products (Gt. Britain) Ltd. He joined the company in 1956.

In order to clarify the position and responsibilities of senior executives, Ultra Electronics Ltd. have made the following appointments: **Dr F. W. Stoneham,** M.B.E., is now executive director, sales and engineering; **Mr Allan Sadler** becomes chief engineer; and **Mr D. S. MacIntyre** is general sales manager.

**Mr G. H. Walton,** a director of British Insulated Callender's Construction Co. Ltd., and of Painter Bros. Ltd., has retired. He relinquished executive duties as joint general manager of the first-named company in 1958, but continued to occupy a seat on the board. He had served with the BIC group and its predecessors for over 47 years.

## OBITUARY

**Mr E. Oxley,** a director of T. W. Sampson and Co. Ltd., electrical contractors of Sheffield, died recently, aged 56.

*Mr L. G. Clifford*

*Mr J. K. Dent*

*Mr. W. G. D. Gregg*

# NEW LITERATURE

### *First Course in Electromechanics*

*by H. H. Skilling*

TWO things are remarkable about this book. First is the down-to-earth manner in which the subject is introduced—a welcome change from the exotic theoretical treatises on electrical subjects which have been pouring from the American universities of late—and the second is the manner of presentation. The author, a professor of electrical engineering at Stanford University, has issued the book as lithographed typescrip, bound with paper covers, for trial and criticism as a prelude to a properly printed regular edition at a later date. In four parts, it deals with the principles of electromechanical energy conversion applications to rotating and static machines, principles of dynamic operation—including one of the more readable introductions to transform techniques—and applications to dynamic operation. It is, of course, a student's book, but it is concerned rather with what electricity will do than what it is. The examples at the end are essentially practical and most pertinent to the text. Published by John Wiley and Sons Ltd., 340 pages, 9 in. by 6 in., paper covers. Price 36s.

### *Time-harmonic Electromagnetic Fields*

*by R. F. Harrington*

A RECENT addition to the McGraw Hill Electrical and Electronic Engineering Series by the author of "Introduction to Electromagnetic Engineering," this is a highly sophisticated mathematical treatise on the theory and analysis of sinusoidally varying electromagnetic phenomena, with particular reference to radio transmission devices. The preface states that it was written primarily as a graduate-level text, but should also be useful as a reference book. There are eight chapters, ranging from a 32-page section on fundamental concepts, to an elaborate exposition on design theories of microwave networks, and five appendices. There are also some 300 problems compiled to illustrate the complicated formulae and theories. Published by McGraw Hill, 472 pages, 9 in. by 6 in. Price 104s 6d.

### *Introduction to Transients*

*by D. K. McCleery,* M.SC., M.I.E.E., F.INST.P.

WITH the object of affording even lame brethren among electrical engineering students facility in handling problems involving transient phenonema, the author of this work revives Heaviside's operational calculus as the most suitable means of approach. Conceding a certain lack of mathematical rigour in the Heaviside technique compared with that of Laplace, the author backs his choice on the grounds that it is more readily absorbed by the student, while at the same time providing satisfactory solutions to a high proportion of practical problems. Following a general introduction to the Heaviside operator and its relation to circuit theory, important chapters of the book are devoted to application of the so-called "expansion theorem," transmission line surges and to response of circuits to alternating voltages. Although concerning itself primarily with electrical theory, the text makes reference, where appropriate, to mechanical analogies. Appendices include a condensed list of Heaviside standard forms and a Gudermannian table for extracting numerical values of hyperbolic functions. Published by Chapman and Hall, 232 pages, 5½ in. by 8¼ in. Price 42s.

### *Microwave Ferrites*

*by P. J. B. Clarricoats,* B.SC., PH.D., A.C.G.I.

IT is refreshing to find a textbook which does not claim to be aimed at the science undergraduate but is unashamedly written for the practical, practising engineer in industry. In this case, it is the microwave engineer engaged on the design of microwave circuits and devices and who needs a full understanding—at least, as far as present knowledge extends—of the theory and principles underlying the structure, preparation and operation of microwave ferrites. In the preface the author remarks that plans for the book were originally made in 1957 when it was thought that "most of the fundamental work on microwave ferrites was complete." New devices and developments have shown how far from the truth this has proven to be.

The work is divided into five sections, three of which are general and two are specialised applications to waveguides and microwave components. Having been closely associated with research and development in this field since 1953, the author writes authoritatively and with an intimate knowledge of his subject. Published by Chapman and Hall, 255 pages, 9¼ in. by 6 in. Price 50s.

### *Wires and R.F. Cables*

*by G. W. A. Dummer and W. T. Blackland*

THIS volume is largely a summary of military and commercial wires and cables, both current and obsolescent, from British and American sources with their related specifications. Part II contains rather more technical information on its subject, radio frequency cables, than Part I and includes an important and informative chapter on the design of such cables. It is a useful book for the aircraft avionic equipment designer for whom, obviously, it has been written. There are also two extensive bibliographies. Published by Isaac Pitman and Sons, 237 pages, 8¼ in. by 5¼ in. Price 47s 6d.

## BOOKS RECEIVED

**Colour Television,** by P. S. Carnt and G. B. Townsend. Description of British adaptation of American NTSC system of colour television. Published by Iliffe Books Ltd., 487 pages, 8¼ in. by 5¼ in. Price 85s.

**Bibliography on beryllium and beryllia.** Unclassified UKAEA work, compiled by U. R. M. Chadwick. Published by HMSO, 17 pages, 11 in. by 8¼ in. Price 3s.

### *Television Receiver Servicing Part 1. Time Base Circuits*

*by E. A. W. Spreadbury,* M.BRIT.I.R.E.

THE second edition of this invaluable handbook on television receiver servicing, it has been brought up to date to cover the latest developments arising from the adoption of 110° short-necked tubes, new shift magnets, up-to-date deflection coil assemblies and even the latest 19 in. and 23 in. tubes. There must be hundreds of the earlier edition still in use among servicing engineers and they would be advised to get the new one without delay. Published by Iliffe Books Ltd., 357 pages, 8¼ in. by 5¼ in. Second edition. Price 25s.

### *Swiss Federal Railways' Electrification Completed*

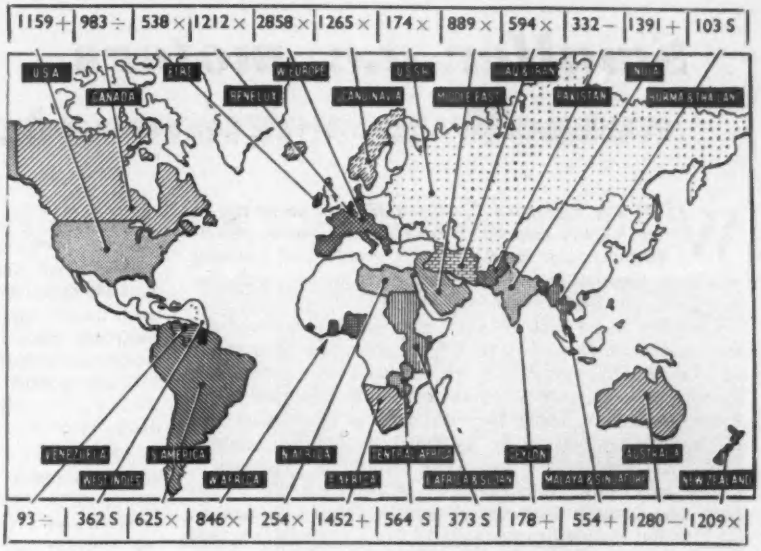
*edited by M. Strauss, C. Whitworth and H. Germann*

WITH the electrification of the Cadenazzo/Luino and Oberglatt/Niederweningen sections of the Swiss Federal Railways, the extensive programme of electrification, commenced in earnest in 1913, is now virtually complete. After a start in 1905, when trials of the first single-phase locomotive commenced on a line between Seebach and Affoltern, experimental systems, single-, three-phase and d.c., were considered and tried before, in 1916, the critical decision to standardise on 15 kV, single-phase at 16⅔ c/s was made and the work of electrifying the whole of the Swiss Railways commenced. Today under 1% of the system is without electric traction.

The history of this giant undertaking is fittingly summarised in an excellent book, which will be a treasured collector's piece in the library of railway enthusiasts all over the world. There are a number of photographs, dating from the earliest days to the present time, and a technical description of the different locomotives which have been, and are still, operating over the system. Some are still in service after more than 40 years. Of particular interest is the description of the new Trans-Europe-Express train set, which is designed to operate over no less than four distinct systems, 1·5 kV and 3 kV d.c. and a.c. at either 15 kV 16⅔ c/s or 25 kV 50 c/s. Published by Swiss Federal Railways, 458-9 Strand, London W.C.2. 142 pages, 7¼ in. by 7¾ in. Price 15s.

**Distribution of Exports in £'000's Sterling**

×=over 25% increase
+=10% to 25% increase
S=10%+ to 10%−
−=10% to 25% decrease
÷=over 25% decrease
on previous year's figures




# EXPORTS IMPORTS *July*

NEARLY £750,000 down in value on the corresponding figure for the previous month, electrical exports amounted to only £24,766,151 for July, despite a £500,000 rise in the amount of radio and electronic equipment sent abroad. Reductions occurred in respect of many types of apparatus, both heavy plant and domestic appliances, even though the figure for the latter was higher than a year ago.

Exports of radio equipment included £51,021 for television receiving sets and chassis (as against £62,638 a year earlier) and £2,278,254 for radio and television transmitters.

The steady revival of the cable industry seems to be continuing, particularly in the wire sphere, exports being widely spread over a wide range of countries, with India taking the largest quota at £162,717. But South Africa was our best customer of all types of electrical goods for the month, accounting for £1,452,970 of the total. That figure included £413,845 for generators and motors, £254,499 for convertors, rectifiers, transformers and switchgear, £228,032 for telegraph and telephone equipment and £97,967 for cables and wires.

The U.S.A. took goods worth over £1·1 million, including £225,179 for convertors, rectifiers, transformers and switchgear, £379,877 for radio and electronic equipment, and £24,152 for cables.

Total electrical imports, at £6,080,861, were a record, being about £32,000 higher than the previous best.

| Description | Exports Value (£) | | Imports Value (£) | |
|---|---|---|---|---|
| | July 1960 | July 1961 | July 1960 | July 1961 |
| Generators | | | | |
| Diesel up to 200 kW | 223,709 | 418,756 | | |
| Diesel over 200 kW | 142,160 | 379,360 | | |
| Steam turbine driven | 76,951 | 71,078 | | |
| Water and gas turbines | 232,879 | 552,380 | 124,200 | 135,342 |
| With i.c. and other prime movers | 28,554 | 62,450 | | |
| Generators up to 200 kW | 84,646 | 154,642 | | |
| Generators over 200 kW | 80,553 | 64,276 | | |
| Generator parts | 842,923 | 735,066 | | |
| Motors, f.h.p. | 304,265 | 262,155 | | |
| Motors 1-250 h.p. | 387,021 | 513,325 | 193,953 | 272,854 |
| Other motors | 353,020 | 271,996 | | |
| Motor starters and controllers | 253,700 | 354,523 | | |
| Converters and rectifiers | 106,181 | 57,578 | 211,692 | 121,501 |
| Transformers | 526,815 | 721,627 | | |
| Switchgear, to 200 A, mv | 354,690 | 488,999 | 129,978 | 141,183 |
| Switchgear, other | 933,812 | 1,131,950 | | |
| *Total, Electrical Plant* | *5,031,879* | *6,240,181* | *659,823* | *670,880* |
| Batteries, primary and parts | 319,060 | 581,944 | | |
| Lamps, filament, over 28 V | 88,448 | 134,349 | | |
| Lamps, filament, under 28 V | 21,591 | 30,900 | 96,849 | 114,808 |
| Fluorescent tubular lamps | 69,813 | 88,068 | | |
| Other lamps and parts | 85,860 | 106,280 | | |
| Radio and electronic gear | 3,524,501 | 5,166,660 | 1,479,441 | 1,680,753 |
| Telephone and telegraphic equipment | 1,541,813 | 1,855,264 | 85,201 | 103,405 |
| Cookers | 48,748 | 36,401 | | |
| Other cooking appliances and parts | 108,785 | 126,709 | | |
| Space heaters | 18,099 | 16,090 | 122,941 | 212,785 |
| Water heaters | 19,772 | 37,017 | | |
| Other heaters and parts | 113,477 | 167,238 | | |
| Electric irons | 74,928 | 62,805 | | |
| Vacuum cleaners | 232,439 | 217,129 | | |
| Floor polishers | 41,205 | 70,248 | 187,751 | 262,300 |
| Food mixers | 57,184 | 102,463 | | |
| Washing machines, up to 150 lb | 441,318 | 685,618 | 88,185 | 60,093 |
| Dryers | 45,425 | 9,306 | | |
| Washing machine and dryer parts | 168,988 | 171,070 | | |
| Domestic refrigerators and parts | 795,044 | 555,645 | 383,558 | 144,770 |
| Other appliances and parts | 329,807 | 355,156 | | |
| *Total, Domestic Appliances* | *2,495,219* | *2,612,904* | *782,435* | *679,948* |
| Portable power tools | 241,136 | 269,264 | | |
| Arc welding plant | 104,953 | 75,000 | 59,345 | 184,565 |
| Resistance welding plant | 54,862 | 37,022 | | |
| Electric furnaces | 82,955 | 144,194 | | |
| Signalling apparatus | 114,358 | 300,746 | | |
| Commercial instruments | 216,387 | 181,211 | 54,097 | 86,949 |
| House service meters | 125,002 | 113,806 | | |
| Wiring accessories | 186,041 | 243,200 | | |
| Fans | 96,083 | 105,245 | | |
| Lighting fittings and lanterns | 301,984 | 302,396 | 182,538 | 199,446 |
| Other lighting equipment | 76,862 | 77,013 | | |
| Telephone and telegraph cable | 354,222 | 417,492 | | |
| Paper insulated cables | 517,046 | 419,146 | | |
| Rubber insulated cables | 212,728 | 275,027 | | |
| Thermoplastic insulated cables | 260,443 | 335,580 | | |
| Winding and similar wires | 134,519 | 193,881 | | |
| Other cables and wires | 150,024 | 179,212 | | |
| *Total, all cables and wires* | *1,628,982* | *1,820,338* | | |
| Accumulators and parts | 284,729 | 327,616 | | |
| Insulating materials | 155,669 | 211,594 | | |
| Industrial electronic control gear | 164,664 | 146,393 | 72,275 | 120,415 |
| Electrical ware | 72,121 | 153,090 | | |
| Permanent magnets | 69,487 | 70,501 | | |
| All other articles | 2,850,581 | 3,350,981 | 1,846,144 | 2,239,692 |
| **Total** | 20,305,040 | 24,746,151 | 5,318,148 | 6,080,861 |

# Smaller a.c. motors

## RATINGS COMPARE WITH GERMAN MACHINES

WITH the European Common Market teetering on our export horizon, British electric motor manufacturers are faced with the problem of building machines competitive in size and performance with the best available from continental makers.

Claiming to be first to tackle this problem successfully are Lancashire Dynamo and Crypto with their new range of "Crypto-D" motors. The motors are totally enclosed, fan-cooled, squirrel-cage machines with outputs from ½ h.p. to 50 h.p. These sizes are now in production and the range is likely to be extended to 125 h.p. shortly with, later, additional ranges for ventilated machines.

The motors are dimensionally to BS 2960, Pt. 2, but they also comply with the American NEMA standards, Continental standards, particularly the German DIN, and IEC recommendations. However, the outputs of the motor are said to be considerably in excess of the requirements of BS 2960, Pt. 2, with performance in compliance with BS 2613 and Class E insulation. The performance of the new motors is considered comparable with German machines built to the DIN specifications and outputs up to 20% in excess of those to the German specifications are expected for the larger range of motors from 50 h.p. to 125 h.p.

The motors are for foot or flange mounting with 2, 4, 6 or 8 poles and for a 3 ph, 50 c/s supply up to 650 V. They are manufactured at the company's Willesden works and have now been in limited production for about three months. A comparison of the size of the new motor with motors to earlier designs of the same rating is shown in Fig. 1. A motor with dimensions corresponding to the 1 h.p. rating of BS 2960, Pt. 2, can now deliver 2 h.p., while the corresponding output for a 40 h.p. frame size motor is now 50 h.p. The new motors are said to have an electrical performance comparable with those to the earlier designs. Typically, a 10 h.p. motor would have

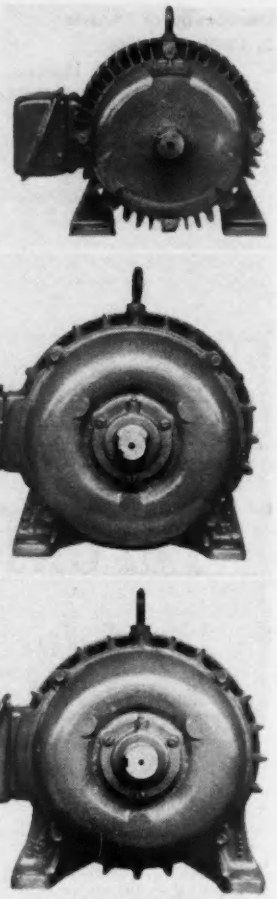


*Fig. 1. Comparative sizes of 10-h.p. motors for 1,500 r.p.m. At the top is the new Crypto-D size, and below are motors to BS 2960, Pt 2 and BS 2083*

85% efficiency, a power factor of 0·84 to 0·85 and a starting current of six times to seven times full-load current. The larger output obtained has certain incidental advantages apart from the obvious ones of reduced dimensions and up to 60% less weight. The new motors have lower inertia than the previous designs and also have good starting torque; for example, a 10 h.p. motor has a starting torque of 190% full-load torque.

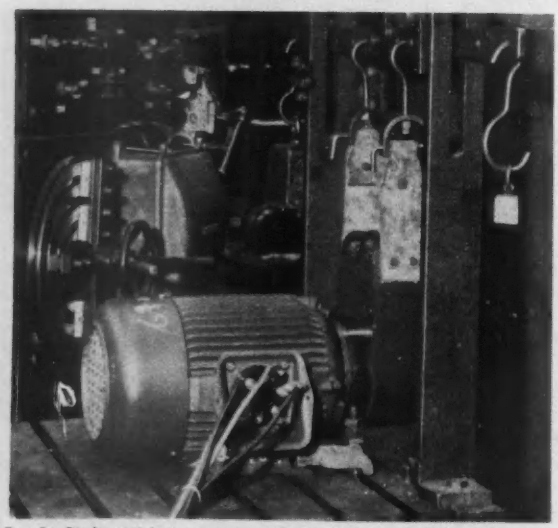


*Fig. 2. Brake test in progress on a Crypto-D 5-h.p. motor. The number and depth of the cooling fins, the clearances in the terminal box and the moulded terminal assembly can be seen*

The increased output has not been obtained by sacrificing performance but mainly by improved design of the cooling system and stator flux distribution. The cooling fins are deeper and more closely spaced than on earlier machines and, the frame, an interference fit, is shrunk on to the stator punchings to give a compact unit with good heat transfer properties. No internal fan is used, but the external fan has been designed to give air flow over the full length of the stator fins. Surface temperature is consequently not excessive, the surface temperature rise on a typical 5 h.p. machine being 28°C and for a 10 h.p. machine 38°C on test.

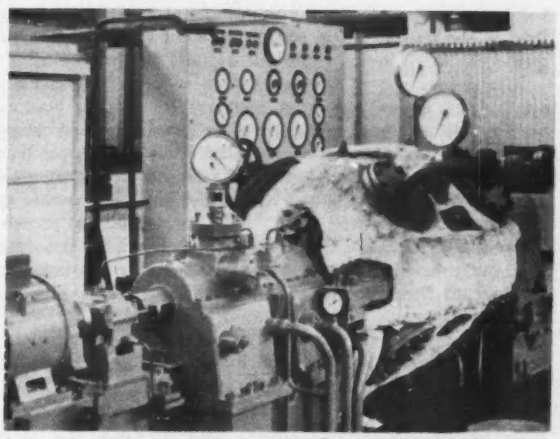
The performance of the motors is claimed to be slightly better than the equivalent German machines and in particular an improved power factor is anticipated. Their price is slightly less than the same motor rating in the larger frame sizes. In designing the motors, attention has been given to the installation and maintenance aspects. The terminals are stud type with adequate clearances and with the terminal box suitable for left- or right-handing with cable inlet adjustable through angles of 90°. Pre-loaded bearings are used suitable for a standard grade of grease. The motor end caps are designed with integrally mounted bearings on the small sizes of frame and separate internal mounting on the larger machines. The end caps remove as a single piece and lugs are provided for removal and for flange mounting. Dimensions of the new motors are given in the company's leaflet SL.2.

# New laboratories at Heaton

## C. A. PARSONS COMMISSION LATEST RESEARCH UNIT

ONE of the results of the phenomenal expansion of turbo-generator unit size and the entry into nuclear and supercritical operational fields has been that manufacturers of turbines and generators have had to completely replan their research and testing facilities. Pioneers of the steam turbine, C. A. Parsons and Co. Ltd., have always kept abreast of developments both in prime mover and generator fields. Moreover, their research facilities, involving considerable capital investment and often including equipment of unique design, have invariably been placed at the assistance of other British manufacturers as well.

When, on June 16, Mr. J. L. Gray, B.SC., M.I.MECH.E., of the CEGB, officially opened the new Mechanical Engineering Research Laboratories at Heaton, a new facility became available for British industry which will undoubtedly be of inestimable value in the next few, highly competitive years.



*A variable density air turbine installed for more detailed research on turbine heading than is possible with steam*

### A 10,000 h.p. Test Rig

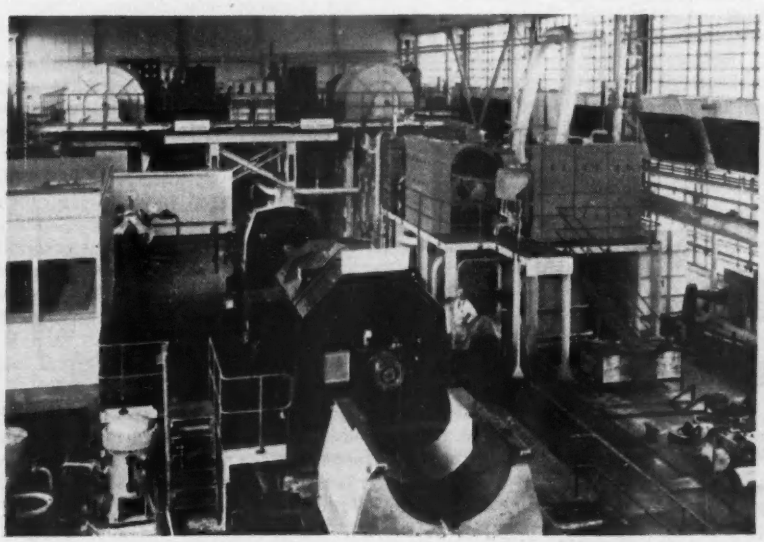
The main unit is a 10,000 h.p. closed compressor and circulator test rig which carries on and extends the researches for which a smaller, 3.000 h.p. unit was developed and commissioned in 1952. The main function of these units is to explore the behaviour of axial and centrifugal compressors specifically designed for nuclear power stations, the test conditions being comparable, as far as is possible, with those to be met within service. The necessity of a larger unit in so short a time has arisen from the expected growth of nuclear station sizes over the next few years now that the initial designs have reached their present advanced stage.

The test rig comprises a closed circuit, 6 ft 6 in. dia duct, 1¼ in. thick, designed to operate with working pressure and temperatures of 300 lb/sq in. and 300°C and mass flows of up to 2,000 cu ft/sec. The venturi measuring section is 157 ft long and has been carefully chosen to ensure an exceedingly low overall pressure drop, an essential requirement in testing gas circulators with their low pressure rise. The pressures are measured in a control room on water or mercury manometers or, in the case of small differential, Betz micromanometers; at pressures exceeding 100 lb/sq in., Budenberg gauges are used.

### Electrical Drive

Power for the compressor or circulator motors is provided from two 5 MW steam turbo-generators housed at the east end of the building. For full load runs, two-pole squirrel-cage motors are used to drive the compressors, the motors being provided with dual windings and six ends brought out to a point where they may be connected in series-parallel, star or delta for operation on 3·3 kV, 5·5 kV or 11 kV. For extended periods at atmospheric pressure, a 1,500 h.p. slip-ring motor with liquid starter is provided as a pony motor, the slip-ring motor enabling the compressor to be run at speeds below synchronous for long enough to allow for mechanical inspection of the plant at lower speeds.

Cooling of the circulated gas after compression is by a cooler of the



*General view of Parsons' new mechanical engineering research laboratory showing the motor drive for the air compressor test rig and, in the background, the two 25 MW steam turbo-generators*

cross-flow gilled tube type, the cooling water sharing the increased capacity of cooling towers with that of the 5 MW turbo-alternators.

## 180 h.p. Model Test Rig

A test rig for checking blading performance for gas circulator and alternator fans is another facility in the new laboratories. Here the outer casing is in three parts. The centre section carries an internal tubular member in which are inserted the stator blade rings and distance pieces under test, the blades being set to the desired angle before insertion in the tunnel. The rotor is split to take the roots of the moving blades under test, each blade being held at the desired angle setting by a set screw. A flexible quill-type drive couples the rotor shaft to the motor.

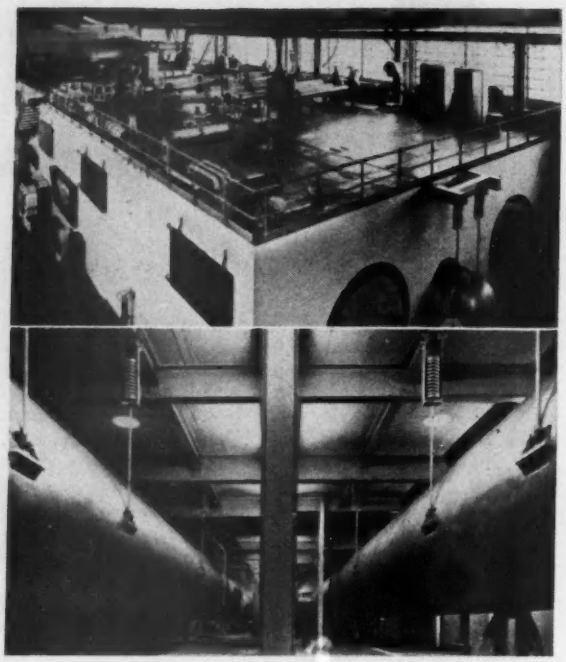
In another part of the laboratory is a variable density air turbine which has been installed to explore blading phenomena in more detail than is possible when using steam. Air for this unit is supplied from a motor-driven axial flow compressor working in a closed circuit. A scale model low-pressure steam turbine, designed to operate at normal vacua and well within the capacity of the present boiler plant, is another new unit which has been provided to investigate blading and other problems in low-pressure turbines of the type that are being used in early nuclear stations.

Aerodynamic rigs, comprising two blowers, each coupled to slip-ring motors, connected in series to feed an 18 in. duct which, in turn, can supply any one of four different metering lengths, provide another facility in the study of aerodynamic factors on model exhaust ends and large exhaust blading.

## Ancillary Equipment

To meet the large demands for $CO_2$ on the 10,000 h.p. circulator test rig, a bulk storage liquid $CO_2$ plant has been installed in the laboratories. In addition, an axial flow compressor provides a high-pressure air supply for the various model test rigs and replaces less effective facilities in the older laboratory.

The new laboratories are housed in a building 250 ft long by 65 ft wide with an excellent approach by rail and road. The working areas are serviced by a 40-ton crane.



*Above, a view of the annexe which houses the ducting, coolers, and measuring equipment of the closed-circuit compressor test rig with, below, the compressor rig ducting in the annexe*

# Barrier Joint for 33 kV Solid Cable

A BARRIER joint for a 33 kV solid-type cable, shown by laboratory tests to provide a sufficient barrier against the fluid pressures encountered in normal service, has been developed by Johnson and Phillips. The aim is to provide a barrier within the normal 33 kV joint. The standard open tube type of joint is modified by using a double chamfered stress cone and lappings of glass tape. Each lapping is well coated with epoxy resin/hardener mixture applied across the joint. For single-core joints, the lappings are applied from sheath to sheath. For three-core joints, plastic or neoprene gloves are used to embrace the crutch of each cable and the lappings are then applied from glove to glove. To prevent solder migration along the strands, a solder block is sweated at the centre of the ferrule. The design is only experimental, but it is stated that electrical stability and impulse strength of the joints appear sound and equal to that of a normal 33 kV joint.

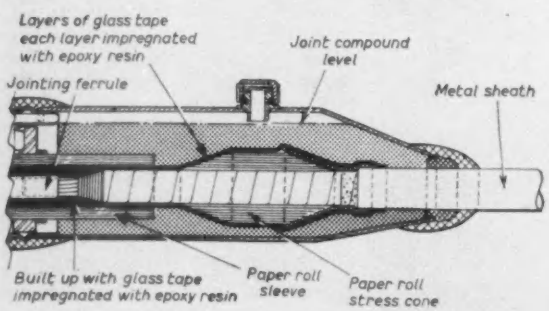

Layers of glass tape each layer impregnated with epoxy resin
Joint compound level
Jointing ferrule
Metal sheath
Built up with glass tape impregnated with epoxy resin
Paper roll sleeve
Paper roll stress cone

*Fig. 1. Section through half of a 33 kV solid-type cable joint box showing the barrier built up from glass tape, impregnated with epoxy resin*

## Cast Resin Joints

The main requirements of such joints is that they should be efficient and simply made. Previously, a similar need arose for 11 kV cables. Here the use of epoxy resin cast with suitable fillers was satisfactory, as the cast served as an insulator and also as a waterproof enclosure. However, similar procedure cannot be used with 33 kV cables because the size of the cast required results in so much heat being produced during curing that honeycombing takes place. Minute air bubbles are trapped in the cast and these are likely to cause premature electrical failure of the insulation under electric stress. It would be possible to make a cast by using a different form of resin mix or by mixing and filling the resin into the joint under vacuum, but the alternative joint illustrated is considered less complicated and less expensive.

In general, barrier joints are not considered necessary if the slope of the cable does not exceed 1/50 for three-core or 1/25 for single-core cables, or if the differences in level are less than 50 ft and 100 ft, respectively. The barrier joint is intended to prevent an excessive hydraulic head.

# PROBLEMS AND PRACTICE

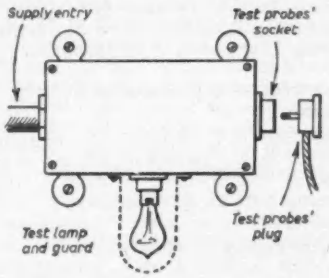
*We welcome contributions to this feature; those published will be paid for at our standard rates. There must be many problems encountered in day-to-day electrical work, or useful ideas or tools devised to facilitate tasks; all make instructive reading.*

## Centrifugal Switch Trouble

TROUBLE was being experienced in a local workshop with a fractional h.p. single-phase motor of the capacitor-start/induction-run type. The main trouble was that it would fail to start on some occasions but behave perfectly on others. The location of the motor was such that it was not easy to reach for detailed examination but, on the weekly maintenance checks, it invariably behaved itself. The situation was most unsatisfactory, for the motor and its associated machine was in constant use and the uncertainty of operation was a constant source of worry to the foreman. After some consideration, I came to the conclusion that the trouble must lie in the centrifugal switch which cut out the capacitor winding when the motor was up to speed. If the switch did not close properly on shutting down, the starting winding would not be in circuit for the next start. I therefore ordered a new starting switch assembly but, as an emergency measure, I connected a single-pole tumbler switch in circuit between the starting winding and neutral, so short-circuiting the centrifugal switch. Instructions were issued that, should the motor fail to start when the push-button starter was operated, the tumbler switch was to be closed and the starter operated a second time. If the motor then ran, the tumbler switch was to be opened as soon as it was up to speed. In due course the replacement centrifugal switch arrived but not before it had been necessary to operate the emergency starting arrangement a few times. When eventually we were able to replace the faulty switch, at the request of the foreman the emergency switch was retained in circuit, but enclosed in a conduit box to prevent unauthorised operation.—*J. H. Robinson.*

## Test Probe Circuit

ALMOST every maintenance electrician's bench has a pair of test probes operating from the lighting supply with a lamp in series. The arrangement is, however, a dangerous one as I learned when a colleague received a near-fatal shock. We therefore decided to install special test points incorporating a small one-to-one ratio transformer with the iron core earthed but with the secondary insulated from earth. The transformer was enclosed in a metal box with holes for ventilation and a b.c. lampholder was mounted beneath in series with the secondary output and one of the socket-outlets which were provided for connection to the test probes. The indicator lamp itself was given mechanical protection by a perforated metal guard. Mains supply was via a switch fuse and the connections to the transformer were v.i.r. in conduit. The use of a plug and socket connection for test probes instead of permanently fixed probes enabled a choice of probes to be used for different purposes, each with its own plug, and moreover, the arrangement helped to leave a tidy bench at the end of each working day.—*S.F.*




*A simple transformer unit for bench testing with probes effectively removes risk of shock*

## Domestic Fuse Troubles

DESPITE the present day ring-circuit and 13 A switch socket practice in domestic installations, the majority of houses still have heating and lighting circuits on the old standards with the lighting usually safeguarded by a single fuse. Consequently, if the fuse should blow, the whole house is plunged into darkness and the darkest corner is almost invariably the one where the fuse-box is located.

I have made a practice in my own home of installing a separately fused lighting point in the fuse cupboard adjacent to the meter board (they are usually close together) connected either across the live side of the lighting main switch or across one of the heating circuits. Consequently, if the lighting fuse should blow, I always have light where I need it to replace the fuse. In the present house, the light is connected to a spare fuse-way on a Wylex switch-fuse unit and is an ordinary switched batten lamp holder. Another safeguard is a lighting standard somewhere in the main living room fed from a small fused socket connected to an adjacent power point. Failure of the main lighting then still enables some light to be obtained from the standard until such time as the fuse is repaired, a valuable asset should the only persons in the room be unable to repair a fuse or know where the fuse-box is. (Baby sitters, for example.)

Finally, I always see that the fuse-board is provided with spare fuse carriers ready wired and identified with the fuse rating for speedy replacement. The modification and the extra fuses mentioned above cost very little to install, but they are invaluable in the average house.—*T. Lambert.*

## Vibration Trouble

THIS is not a very usual occurrence but it is indicative of the sort of cause of trouble which would not normally be expected. The complaint was from a shoe polishing machine in which the motor control panel was mounted on the main bed of the machine, close to the motor. It was stated that the push-button starter would open at frequent intervals without warning. Examination of the silver contacts on the starter revealed a considerable amount of pitting, but replacement did not entirely cure the fault. We suspected that vibration was the cause and checked by hammering the panel with our fists while the motor was both running light and loaded. On frequent occasions this was sufficient to trip the starter. The machine bed was securely fixed to the wood floor by coach bolts and should have been sufficiently firm to prevent vibration, but one bolt appeared to be not so hard down as the others. On removal, it was found that this had pierced the block floor and the point was cutting into the concrete, breaking the seal between floor and block and forming a fulcrum on which the machine could rock. The bed was refixed with rag bolts grouted into the concrete.—*H. Mitchell.*

## Delayed Action Shock

AN apprentice in a switchgear test room had received a severe shock from the primary of a potential transformer and had been thrown clear. Picking himself up and feeling rather foolish, he was approached by the foreman who asked what had happened. The apprentice told him but said that he felt all right again. The foreman insisted that he went home and gave him a pass-out. He left the factory jauntily, but ten minutes later and a quarter mile away he crawled up his home steps on hands and knees and was in bed for three days. It is as well to remember that the physical reaction to a severe electric shock, even if not accompanied by burns, is sometimes a delayed one. So don't be deceived by an immediate recovery.—*Ion.*

# new products and appliances

### Attractively styled panel meters

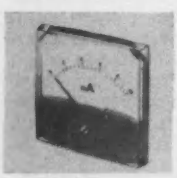
NEAT attractive styling, plus good readability, are features of a new range of panel-mounting current/voltage meters. Incorporating open-type scales with clear, moulded covers, these instruments are available with either square or rectangular fronts. To blend with individual panel layouts, front inserts are supplied in a choice of seven colours. Other external features include use of cypher scale captions and lance pointers. The range of meters comprises moving-coil and rectifier types for standard d.c. and a.c. current and voltage measurements, with thermocouple types for h.f. current measurement. All these instruments have shock-resistant, spring-loaded jewelled movements. *Sangamo Weston Ltd., Enfield, Middx.*

### Higher loading for Metway fire

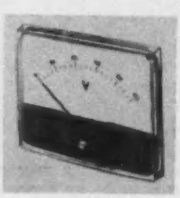
DEMAND for a higher loading in the "Rioway" spiral element fire has resulted in Metway introducing a 1 kW model. This rating is ¼ kW higher than the previous heater. The fire has a chrome grille and adjustable reflector and can be either free-standing or wall-mounted. It sells at £3 16s 11d, including purchase tax and surcharge. *Metway Electrical Industries Ltd., Canning St, Brighton 7.*

### High-capacity rotary mains switches

AS a supplement to the well-known "Hidutac" range of switchfuses, production of a corresponding range of enclosed and cubicle mounting switches has been announced. Claimed to have virtually unlimited life for normal full-load switching applications, when occasion demands they can break up to eight times their rated current. They offer the additional advantage of being compact yet offering ample wiring space. Ratings at present available are 15 A and 30 A. A 60 A model is to be put on the market in the autumn. *The General Electric Co. Ltd., Installation Equipment Group, Four Ashes, Wolverhampton.*



*Sangamo Weston panel-mounting ammeter has a clear moulded cover.*



*A voltmeter in the same range of instruments.*

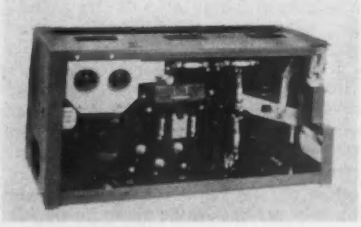
### New process cuts cast-iron welding time

EMINENTLY suitable for carrying out *in situ* repairs on cracked castings of broken-down machinery, the recently introduced "QuenchWeld" process obviates the need for time-consuming preheating and other special preparation associated with conventional methods for welding cast-iron. Other advantages claimed for the new process are the low welding temperature involved and the comparative simplicity of the equipment required. Three proprietary electrodes are employed; the first is for cutting and grooving the fracture to receive the welding alloy, the second for conditioning the surface of the base metal, the third electrode supplying the actual alloy for the final stage of joining and filling. The welding alloy is compounded to give low carbon content and to have grain refining properties, thus reducing chances of cracking. Total process time is said to be only one-tenth that required for other cast-iron welding methods. *Eutectic Welding Alloys Co. Ltd., North Feltham Trading Estate, Feltham, Middx.*

### Pressure-operated switch range

HAVING a wide range of hydraulic and pneumatic control applications, a recently announced pressure differential switch features variable pressure adjustment to suit particular installation requirements. Adjustment is effected by rotating an internal wheel controlling spring force between actuating diaphragm and switch contacts. A range of types is available, suitable for maximum working pressures ranging from 15 lb/sq in. to 400 lb/sq in. and having corresponding minimum differential operating pressures of ¼ lb/sq in. and 5 lb/sq in. Maximum pressure differential setting possible is 95% of the working pressure. Diaphragms are available in spring steel, stainless steel or beryllium-copper, and the switch chamber can be supplied lined with neoprene for use with corrosive fluids. Designed for single-phase mains operation, the switch has three terminals, providing one set of normally open contacts and one set normally closed. *Bailey and Mackey Ltd., Baltimore Rd, Birmingham 22B.*

*Typical plug-in starter trays for GEC motor control centres. Unit on right incorporates switch-fuse interrupter, with c.b. model below*

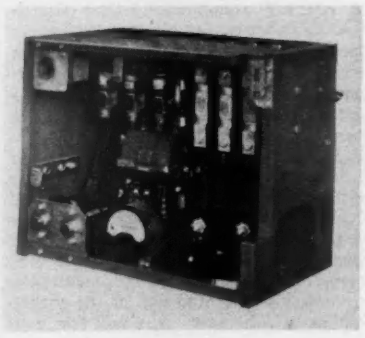


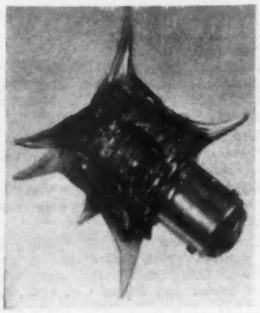
### High-voltage silicon diodes

HAVING current ratings of 18 A and 30 A, two new ranges of medium power silicon diodes are available suitable for peak inverse voltages from 100 V to 1,500 V. Stud-base mounting, incorporating anode connection, is employed for these devices, an insulated flexible lead forming the cathode connection. The diodes are hermetically sealed using the latest glass/metal press-sealing techniques. *Westinghouse Brake and Signal Co. Ltd., 82 York Way, King's Cross, N.1.*

### Improved GEC motor control centres

THE recent introduction of "duplex" cubicles is among several new features improving the scope of the GEC range of a.c. motor control centres for supply voltages up to 550 V. First brought on the market about three years ago, the basic equipment embodies unit construction with single- or double-fronted cubicles. These are designed to accommodate a number of motor starter, or reverser units, having various standard ratings to suit customer requirements. Extensions to an existing control scheme can be readily taken care of by bolting on additional cubicles alongside. The new duplex cubicle is equivalent to two standard cubicles mounted back-to-back, but with the advantage of a 6 in. reduction in overall depth. The starter units are mounted on plug-in trays which can be easily removed for servicing. The units incorporate either switch-fuse or circuit-breaker mains interrupter and the range available now covers motor ratings from ¼ h.p. to 150 h.p. with switch-fuse ratings up to 200 A. Each starter unit has three self-aligning, spring-loaded contacts at the rear which engage with vertical busbars at the back of the cubicle. Feeder cables connecting the starter to the motor pass from a vertical duct on the side of the cubicle. *GEC, Ltd., Witton, Birmingham 6.*





*Primarily for decorative purposes is the "Satelite" lamp by Courtney Pope*

### "Satelite" lamp

CALLED "Satelite," a decorative lamp from Courtney Pope is supplied in seven colours with the glass outers covered in spiked protuberances. This is said to give a twinkling effect. Colours include crystal, red and amethyst, and the selling price, including purchase tax, has been fixed at 11s 9½d per lamp. *Courtney Pope (Electrical) Ltd., Amhurst Pk Wks, Tottenham, N.15.*

### Sunbeam appliance prices up

FOLLOWING the recent 10% purchase-tax surcharge, Sunbeam Electric have raised the prices of their appliances to include this charge. The Mixmaster, Model 12, now sells at £23 14s 1d. Other kitchen aids and razors have also been included in this general increase. *Sunbeam Electric Ltd., 14-16 Old Quebec St, W.1*

### Blankets carry three-year guarantee

"WARM-GLOW" electric blankets from Ekco now carry a three-year guarantee and are available in both popular and de luxe qualities. Single- and double-bed sizes have double-pole illuminated "on/off" switches and de luxe models are fitted with "Ekcostat" automatic heat control. This control provides individual temperature regulation for either side of the bed. The "Ekcostat," say the makers, can be fitted to any switch-controlled blanket, whatever its make. It costs 32s 6d. Prices of the blankets range from 69s to £14 0s 5d. *E. K. Cole Ltd., Southend, Essex.*

### Mine loco features improved battery servicing facilities

IMPROVED versions of battery container and battery isolating switchbox are among modifications incorporated in the latest type AEI "DBF12" storage battery locomotive for coalmine operation. The 14-ton loco has two battery containers, each accommodating 48 lead-acid cells. Battery replacement is effected using the "roll-off" method with the aid of ancillary equipment. To facilitate this procedure, the pair of containers is bolted together to form a single five-ton unit. Batteries can also be replaced by applying the "lift-off" method to each container separately. A battery isolating switchbox is mounted at one end of each container, with access to the battery charging plug on the side of the loco. As a safety measure, battery terminals are permanently connected to each switchbox, thus obviating the need to handle live terminals when the loco is below ground. An improvement in the design of the locomotive itself is the introduction of a central joint in the main frame, so that the vehicle can be split into two sections to facilitate transport to mine workings. *Associated Electrical Industries, Traction Division, Trafford Pk, Manchester.*

### Razor prices increased

PRICES of the Schick electric razors have been raised since the purchase-tax surcharge imposition. Retail cost of these razors now range from £11 15s for the three-speed triple voltage model, to 6 gn for the ladies' shaver. *Schick Inc. (UK) Ltd., 86a Brook St, W.1.*

## Heater makers launch new lines

APPROACHING winter months bring with them new season's domestic heaters launched by manufacturers. To the fore are Ekco who are introducing three models, one a fan heater and the other two conventional fires. The fan heater, "Fandair II," is an improved version of the Mk I model. It is loaded to 2 kW and has a seven-position switch giving a choice of fan speeds and degrees of heat. Equipped with a carrying handle, this model can be used either on floor or table or, alternatively, suspended from wall bracket or arras rails. Finished in light hammertone bronze, the heater has a gold-coloured facia grille and sells at £10 18s 10d.

Designed to fit neatly into standard 16 in. fireplaces as either a permanent or temporary installation is the "Malvern" hearth fire. Having 3 kW loading, it is said to have realistic flame effect. To prevent chimney draughts and heat losses, a removable flue restrictor is provided, and separate switches control the three elements. "Malvern" is available with coal or log effect and it is finished in hammertone bronze. Retailing at £12 13s 7d, spare coal or log effects are available at an extra cost of 30s.

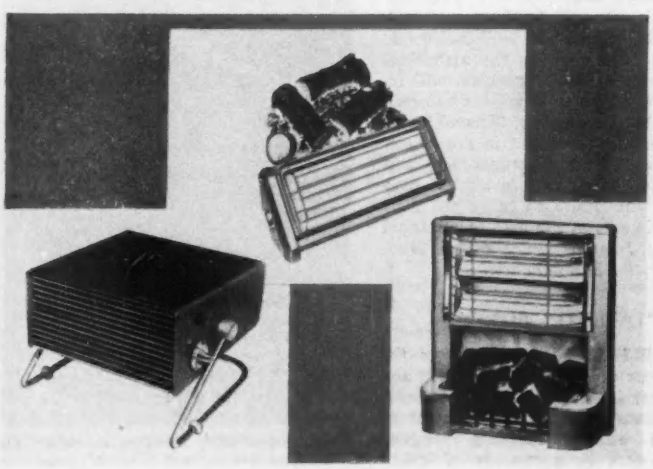
Last of this trio is the "Corona" coal-effect fire with rod-type elements and chrome-plate parabolic reflectors. Two models of this fire are available, a 2 kW unit with separately switched 1 kW elements and a 3 kW unit with three 1 kW elements. If required it can be used with flame effect only and, like the "Malvern," is finished in hammertone bronze. Prices for these fires are £12 11s 4d for the 2 kW model and £14 1s 9d for the 3 kW fire.

### Panel sections

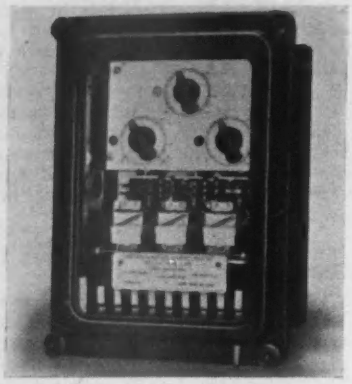
Pioneers in the field of tubular heaters, Unity Heating have this month introduced a 2 ft 6 in. skirting panel loaded to either 120 W/ft or 180 W/ft. These panels are 7½ in. wide and ventilated at regular intervals by grilles, but an unventilated 5 in. wide model is being manufactured with 60 W/ft loading. Dummy sections of wood can be supplied to provide corner mitres and metal dummy sections are also available to the nearest ¼ in. Panels cost £4 10s including tax.

A range of fires recently approved by BEAB and being launched on the market for the heating season are from Taylor Wilson. There are six fires in this range, all called after birds. Two of these, "Eagle" and "Albatross," have traditional styling. Both have flicker log effect and give the appearance of open-type fires with elements placed high on a back-plate. Common to both fires are twin elements giving a total loading of 3 kW and twin control switches for these elements. In more modern vogue are the "Swallow" and "Flamingo," both of which have tubular elements giving total loadings of 2 kW for each fire. Feature of the "Flamingo" is a glass fibre coal effect. Prices of this sextet, which include a hearth-type model, range from £10 1s 10d to £25 4s 6d.

*E. K. Cole Ltd., Southend, Essex.*
*Unity Heating Ltd., Southampton.*
*Taylor Wilson Ltd., Taywil Wks, Accrington.*



*Lower left, the "Fandair II" tangential fan heater; lower right, "Malvern" with coal effect; and centre, for fitting into hearths, the "Corona"*



*Type CAG17 protective relay by English Electric*

### New EE relay has low overreach

POSSESSING an exceptionally shallow overreach characteristic, a new instantaneous overcurrent relay can be set at correspondingly low values of pickup current. With systems having a reactance/resistance ratio of 6, an overreach of only 5% is claimed, this figure decreasing to 1% for lower reactance ratios. This feature, it is said, particularly recommends use of the relay for transformer feeder protection. Used in conjunction with normal time-graded protection, the lower relay setting enables protection from faults, not only within the feeder itself, but also from bushing flashover on the h.v. side of the transformer. Designated type "CAG17," the unit incorporates pickup current settings continuously adjustable over ranges 200% to 800% and 500% to 2,000% of 1 A and 5 A. *English Electric Co. Ltd., English Electric Hse, Strand, W.C.2.*

### Two-speed general-purpose drill

A MORE powerful version of their two-speed general duty drill announced by Wolf Electric has up to ½ in. dia drilling capacity. With a normal speed of 1,350 r.p.m. for holes up to ¼ in. dia, changeover to 550 r.p.m. for drilling larger holes is effected by depressing a plunger. Known as the "TS35," the tool is available fitted either with a No. 2 Morse taper sleeve, or a ½ in. keyed chuck. Price with the latter fitting is £26 15s. *Wolf Electric Tools Ltd., Pioneer Wks, Hanger La, W.5.*

*Wolf Electric ½ in. capacity two-speed drill*

# TRADE PUBLICATIONS

STONE-PLATT.—72-page booklet intended as a guide to the products and services of the Group. Index in four languages. Stone-Platt Industries Ltd., Oceanic Hse, Cockspur St, S.W.1.

STURTEVANT.—Twelfth edition booklet, entitled *Electrostatic Precipitation*, publication 7018. Describes electrostatic precipitator installations in power stations, cement works and other industrial undertakings. Includes 149 illustrations in its 76 pages. Brochure, 19 pages, detailing range of paddle-bladed "D" fans for dust and fume exhaust applications. Supersedes publication 2604. Illustrated leaflet describing anodes made by Sturtevant Engineering Co. Ltd., Cannon St, E.C.4.

TWW.—Bi-annual catalogue of machinery including electrical plant stocked by Thos. W. Ward Ltd., Albion Wks., Sheffield.

TYER.—Illustrated leaflet describing "Perram" transistorised photoelectric counters. Tyer and Co. Ltd., Perram Wks, Merrow Siding, Guildford, Surrey.

VOKES.—Leaflet describing "Autoroll" Mk. II, automatic air filter by Vokes Ltd., Henley Park, Guildford, Surrey.

VOLEX.—Booklet describing floor warming cables made by Volex Electrical Products Ltd., Salford 6.

WESTINGHOUSE.—Two leaflets detailing single- and double-acting pneumatic cylinders and power delay valves for collieries. Westinghouse Brake and Signal Co. Ltd., 82 York Way, N.1.

WILKINSON RUBBER LINATEX.—Illustrated booklet, 24 pages, describing "Linatex" rubber-lined, pinch type valves for handling abrasive slurries and corrosive fluids. Wilkinson Rubber Linatex Ltd., 1-4 Gt. Tower St, E.C.3.

# Materials for Electrical Design

## NEW SYNTHETIC ELASTOMER

IN so far as cable and wire insulation is concerned, the natural and synthetic elastomers form by far the most widely applied dielectric coverings. Of recent years the natural elastomer, rubber, has tended to fall out of favour with the development of the synthetic materials, largely on account of their better life in service. Moreover, the wider choice of basic materials compounders, extenders and plasticisers available enables the finished elastomer to be "tailored" to meet specific requirements, both mechanical and electrical, within limits which are constantly expanding. The vinyl chloride polymers and co-polymers are, perhaps, the most outstanding example.

Now a new material, "Diene," has appeared on the scene of which much is expected.

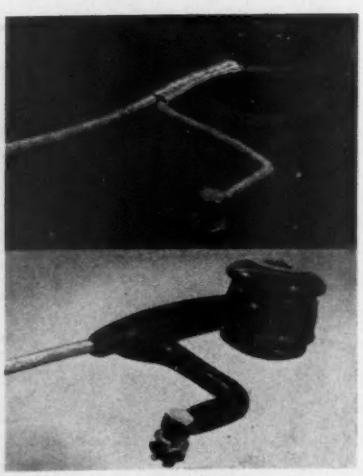
A polymer of butadiene using alkyllithium as a catalyst, the new basic material is completely amorphous with a linear structure and its low temperature properties are far superior to those of natural rubber. Already proven mechanically in many fields of application, including heavy-duty truck tyres, "Diene" is now being examined for electrical applications. First indications are that the electrical properties will be good, depending, of course, on the associated compounders. More information will be released from time to time as it becomes available; but, meanwhile, "Diene" polymer, which was developed in the Akron Laboratories of the Firestone Tire and Rubber Co., is already available here for those who desire to carry out their own experiments in the field of electrical application. *International Synthetic Rubber Co., Hythe, Southampton.*

## "TALURIT" PUTTY

A PROBLEM which often faces the designer of electrical equipment and the engineer in the field is that of insulating awkwardly shaped components or assemblies without specially designed shields, covers or surrounds of established insulating materials. To some extent this is effected by the use of insulating tapes but, as every engineer will agree, tapes are not always the ideal or even possible form of insulation.

Now a material has arrived, a plastic putty comprising two ingredients, a resin and a hardener, which can be combined into a readily workable combination for moulding around the component or assembly and which will cure to a hard and durable state at room temperatures in from 1½ hr to 18 hr. It is dimensionally stable and offers exceptional resistance to oil, spirits and water. When set, the u.t.s. is given as 700 lb/sq in. and compressive strength as 11,200 lb/sq in. Dielectric strength is 253 V/mil and water absorption 2·7%. Insulation resistance is also good.

Apart from its obvious potentialities for the electrical engineer, "Talurit" is also invaluable for repairing leaks and cracks in vessels, insulators, pipes, castings, etc., and can be drilled and tapped. *Cable Covers Ltd., St. Stephens Hse, Westminster, London S.W. 1*



*An overhead cable terminotion before and after covering with "Talurit" putty*

# News of the Week

## Flatley Creditors to Meet

*Informal Discussions in Manchester*

AN informal meeting of major creditors of A. J. Flatley Ltd., clothes dryer and washing machine manufacturers, of Manchester, has been called for 4 September. The creditors concerned, probably about 20 in number, are those to whom amounts of £4,000 or more are outstanding, we are informed.

The meeting has been called by A. J. Flatley Ltd. in order to explain the situation to these firms. Representatives of the companies are to consider a problem which has arisen, the result of overstocking it seems, which has brought temporary embarrassment for Flatley's. There is no suggestion of any liquidation, it must be emphasised. In fact, we were told on Friday by Mr G. D. Broadfoot, joint managing director, that production of the new low price folding clothes dryer (referred to in our 6 July issue) is to commence in the new factory in Ireland within the next few weeks and a new refrigerator is planned.

### Cromptons leave A.P.C. group

MR J. V. DANIEL, managing director of Crompton Parkinson Ltd., has resigned from the board of Atomic Power Constructions Ltd. This announcement, made last week-end, follows the withdrawal of the firm from the Atomic Power Constructions consortium, which, we now understand, was initiated when the latter joined forces with the G.E.C.—Simon-Carves Atomic Energy Group in the formation of the United Power Co. Ltd., to which we referred on 6 October, 1960.

That linking-up reduced the number of consortia competing for nuclear power stations to three—the other two being the Nuclear Power Group and the English Electric, Babcock and Wilcox, Taylor Woodrow Atomic Power Group.

### Advanced Computer for Government Research

A CONTRACT has been placed with Ferranti for a £3½ million "Atlas" computer installation for the NIRNS Rutherford Laboratory at Harwell. Capable of handling large quantities of data at extremely high speeds, cost of computing is expected to be considerably less than for computers at present installed in the UK. When it is ready for use in early 1964, the computer will be set to work on problems connected not only with nuclear research, but also biochemistry, meteorology and astrophysics. Besides the UKAEA, computing time will be made available to other Government departments and to universities. Limited only by the transmission speed of data pulses within its circuitry, "Atlas" can perform up to a million operations in a second.

### IMPORT SURCHARGE BY CHILE

NEW non-returnable import surcharges on a wide range of goods have now been imposed by Chile. Among these are domestic washing machines, fluorescent tubes (15 W and 40 W), batteries, certain types of lamps, welding plant, television equipment and headphones for radio receivers, all of which bear a 75% tax.

### U.S.S.R. go-slow on nuclear power

BECAUSE of the large reserves of fossil fuel in USSR the problem of energy production by nuclear power is not acute. This is the view given by Dr Ivan Bondarenko at the International AEA conference in Vienna this month. In the fast reactor field the transition to the practical stage began with the construction and operation of a 5,000 kW plutonium oxide reactor. Work on a fast reactor with an electrical output of 50 MW and a thermal power of 250 MW has been dropped. But nuclear engineers are considering the design of an 800 MW reactor.

### NEW STATION FOR DURHAM?

A NEW power station in the Durham coalfield is "a strong possibility," according to Lord Robens, chairman of the National Coal Board. During a visit to north east pits last week-end he said that he was confident that such a project was possible if the Board could produce coal at the right price. He emphasised that the N.C.B. would have to guarantee a supply of fuel for the life of the station, and said that future coal developments in Durham would be concentrated on coastal pits, as pits in the west were being worked out.

### Instrument maker adds U.S. range

ELECTRO Mechanisms Ltd., makers of transducers and amplifiers at Slough, are adding products of Schaevitz Engineering, of New Jersey, to their range. Under an agreement which provides for the fullest exchange of technical information, Electro Mechanisms will acquire rights to the Schaevitz range of linear and rotary differential transformers, dynamometers and transducers. Also in the agreement are the full range of Schaevitz centrifuges, which may calibrate small instruments to large electro-mechanical assemblies.

### E.E. put off 200 at 'fridge plant

ENGLISH Electric are the latest to join the list of companies who have announced retrenchments at their refrigerator plants. Two hundred employees at EE's Liverpool factory will receive dismissal notices at the end of this week. Meanwhile, retrenchments already announced by AEI-Hotpoint, Electrolux and others are taking effect.

### B.S.R. DROP 'FRIDGE PLAN

IN view of the present refrigerator stocks position in England and Europe, Birmingham Sound Reproducers Ltd. have decided to suspend their plan to market a new refrigerator. Dr D. M. McDonald, chairman, considers that efforts could be better employed in other directions. A spokesman for the company said there were one million unsold refrigerators now on the German market and a similar number lying in Italian warehouses, while in this country "distress selling" had been going on for some months.

BSR first announced their plans for large-scale refrigerator production in April, 1959. A new factory in Londonderry, N. Ireland, was then envisaged, but a month later the scheme was changed to a larger plant at Old Hill, Staffs. Deferment of that plan was subsequently announced, and last June, Dr McDonald revealed that a 4 cu ft compressor model would be made at a Stourbridge factory, to retail at about 39 gn. The company had already acquired the name Monarch Electric as the title for its new subsidiary to produce domestic electrical appliances, the first of which was to have been a refrigerator.

A level of 60 lumens/sq ft on the drawing boards is given in the drawing office of the recently completed laboratories of Hepworth and Grandage Ltd., Bradford. Over 60 AEI twin lamp 5-ft fluorescent fittings are mounted directly on invert-trunking

# Safety Supervisors for Contractors

EVERY employer of workmen who normally employs more than 20 persons on building operations or works of engineering construction will be required to appoint a safety supervisor according to regulations published last week under the Factories Act. It is immaterial whether the 20 persons are employed on the same site or at any one time.

The safety supervisor will be required to advise the contractor or employer on the observance of safety rules and to exercise general supervision on the safe conduct of work generally. The name of the person so appointed must be entered on the abstract of the Factory Act requirements. The appointment of a supervisor will not necessarily need to be a full-time one, but his other duties must not prevent him discharging the responsibilities assigned to him under the regulations. He can be responsible for more than one site and two or more employers can appoint the same person.

The regulations will come into operation on 1 March, 1962, and generally cover building sites and demolition work. They have been modified in a few respects from the statutory draft which was noticed in the ELECTRICAL TIMES of 3 Nov. last. The draft regulations required that on demolition sites, electric cables or equipment which might cause danger should be disconnected, unless being used for the demolition work. This absolute requirement is removed from the regulations now made, but there is a new general requirement, applying to all construction work, that "all practical steps shall be taken to prevent danger to persons employed from any live electric cable or apparatus . . . either by rendering such cable or apparatus electrically dead or otherwise."

Where an overhead cable or high-mounted electrical apparatus may cause danger on a construction site, "all practical precautions" are required to be taken to avoid an accident, by providing barriers or by other means.

## G.E.C. CHANGES . . .

### *New Distribution Scheme*

UNDER a new distribution scheme aimed at improving service to wholesalers and contractors, the General Electric Co.'s Installation Equipment Group is to have larger depots of its own, replacing the shared depots of the old GEC network. The arrangement is expected to be in operation before the end of September.

Deliveries will be made from six large existing depots, in London, Glasgow, Birmingham, Leeds, Preston and Gloucester, each of which will carry considerable stocks of cables and other installation equipment. The London depot will also service export customers. The depots will be organised on up-to-date lines, and mechanised as far as possible.

Announcing the scheme, Mr R. H. Phillips, managing director of GEC's Installation Equipment Group, emphasised that the group is determined to accelerate its sales policy of distributing mainly through wholesalers. The aim is to provide the bulk of sales through wholesalers, with other outlets probably accounting for only about 10% of the trade.

### *. . . Lighting and Heating Move*

THE Central, North and South London sales areas of the GEC Lighting and Heating Group have now been merged into one organisation, operating from new headquarters at Lena Gdns, Hammersmith, W.6 (telephone: Riverside 4671). This new organisation, with full sales and technical services, is headed by Mr S. E. Mason, previously manager, Central London area. Mr J. T. Mellor becomes manager, technical services, Mr T. E. Pickering, area chief lighting engineer, and Mr G. W. Findlay, area chief heating engineer. The group's offices and trade counter service at Hanger La, Ealing, has been withdrawn.

## Clydesdale Withdrawal

The offer by an unnamed London group of 7s 6d in the £ to unsecured creditors of Clydesdale Supply has been withdrawn, at least for the time being. Meanwhile, Craibstone Investments have raised their bid by 1s to 6s.

## HEATRAE BUY GLASGOW FIRM

THE profitable Glasgow heating equipment manufacturing business of Duncan Low Ltd. has been acquired by Heatrae for £86,100 cash. In a letter to shareholders, the Heatrae directors confirm that this is the private company they were negotiating for earlier this year. Duncan Low now becomes a wholly owned subsidiary. Its products, comprising electric thermal storage water heaters, immersion heaters, electric and steam oil heaters for industrial and marine applications, and other heating equipment, are described as "complementary to a degree" to those of Heatrae and will widen the range of equipment offered.

Profit of Duncan Low for the year to April 30 last was £17,400 before tax, and it is hoped that earnings in the current year will not be less than this. The existing management of Duncan Low is being retained, but steps are being taken to rationalise and integrate activities "so far as seems desirable."

## OFFICIAL PUBLICATIONS

Construction (Lifting Operations) Regulations, 1961. S.I. No. 1581. HMSO, 1s.

Construction (General Provisions) Regulations, 1961. S.I. No. 1580. HMSO, 9d (see this page).

Road Research, 1960. HMSO, 7s (see page 292).

Ministry of Power Statistical Digest, 1960. HMSO, 27s 6d.

B.S. 3456. Testing and approval of domestic electrical appliances. Section A8, immersion heaters; (5s.); Section A9, irons (4s 6d); Section A10, steam irons (5s).

## E.T.U. Threat to T.U.C.

THE recommendation that the Electrical Trades Union should be expelled forthwith from the TUC, approved by the latter's General Council last week, is to be debated by Congress next week. The Council are also asked to take the necessary steps to make it possible for the ETU to be re-affiliated.

But the ETU Executive, minus Mr Byrne, on Monday decided to drop the threat of legal action against the TUC, made in a letter from the ETU's solicitors. That threat arises not on the proposal for expulsion, but from the three-point ultimatum recently sent by the TUC General Council to the ETU leaders. This demanded that Mr F. Haxell, the former general secretary, and four other Communists should be debarred from office for five years; that Mr F. Foulkes, the president, should resign and seek re-election, and that Mr J. Byrne should be allowed to exercise all the powers of the former secretary.

# P.T. on all Block Storage Heaters

THE long drawn out discussions on thermal storage heaters which resulted from the announcement by Thermodare of a domestic model has finally been resolved by the Customs and Excise ruling that all such heaters as well as industrial and commercial units will attract purchase tax.

This becomes operative from 1 September as we intimated in 23 August issue. The majority of manufacturers have accepted the ruling and are accordingly altering their retail prices. Thermodare (Great Britain) have announced their new price list this week. Previously heaters sold for industrial and commercial use did not attract purchase tax and the Electricity Council have accepted the Customs and Excise ruling "as it now obtains, with considerable regret."

Although the Council accept the decision, one manufacturer, Mantle and Butterworth Ltd., have lodged an appeal on the grounds that their two larger models, rated at 4½ kW and 6 kW, would be too large for normal domestic application. A spokesman for the company said "whereas the imposition of 25% purchase tax on a lower rated unit costing £20 does not amount to much, the same imposition on a model costing between £60 and £80 makes a lot of difference."

## No More d.c. at Cardiff

STARTING with 46,000 d.c. consumers at vesting date, SWEB have now reduced this to a small number in Newport. The last two d.c. consumers in Cardiff were converted last month, and at a ceremony on Tuesday, Mr E. Jones, former deputy chairman of SWEB, pressed the button which shut down the last rotary converter at the substation in the basement of The Hayes showroom.

## Airborne Computer aids Navigation

TO lighten the burden of navigational computation demanded by today's high-speed aircraft, the Royal Aircraft Establishment, in conjunction with GEC, are developing an airborne computer for the task. Known as "DEXAN," the equipment works solely from information supplied from navigational aids aboard the aircraft, computing incremental changes of latitude and longitude without the help of ground-based installations. Starting from a known flight position, ground-speed and bearing data is fed into a digital differential analyser from the aircraft's Doppler radar and gyro-compass equipment. From results calculated, the aircraft's topographical position is displayed on a map moving behind a screen. This is controlled by the computer such that the aircraft's calculated position appears at the centre of the screen. During flight trials with "DEXAN" installed in a "Comet" aircraft, calculated flight position, was checked at 50 mile intervals with reference to a series of Decca navigational "fixes." Any error between true and estimated position was then automatically corrected by the computer.

## RADIO SALES BEST FOR YEARS

RADIO and TV retailers are smiling at last. TV sales in June were almost up to their 1959 level and radio sales were the best for years, if not the best ever. Due largely to the popularity of transistor radios, especially among the young who want rings on their fingers and music wherever they go, radio sales shot up from an average of 12 per shop in May to 22·4 in June. This is much sharper than the usual seasonal increase, for the corresponding rise a year earlier was from 11 to 15 sets per shop.

TV sales in June averaged five per shop, against four in May this year and 3·7 in June, 1960. Rentals, however, were the same as in May at 2.3 per shop.

The effects of Mr Selwyn Lloyd's p.t. surcharge have yet to be felt in full, but it is believed in the trade that they will be slight, particularly as a number of manufacturers have absorbed the increase, both in radio and TV. In any event, there is no lack of interest in radio shows, 150,394 having paid to go through the turnstiles at Earls Court in the first four days, including Saturday. GEC's own free show at Westminster proved particularly successful, 102,465 of the general public having attended in the six days, excluding about 11,000 ticket holders. An attendance of 50,000 would have been regarded as "highly satisfactory."

## Discussions on Retailing

RETAILING has been the subject of several discussions recently by the National Electrical Contractors' Trading Association and the Radio and Television Retailers' Association. The two associations have now decided to establish a joint co-operation committee in order to advise their respective members on matters of mutual interest.

## Export orders rise sharply

A PARTICULARLY fine export performance was achieved by the engineering and electrical goods industries in June. Deliveries were the highest for months and were fully 25% greater in volume than in the previous June. Moreover, new orders also jumped sharply and were 30% higher than a year ago, so that the gradual lengthening in order books continued.

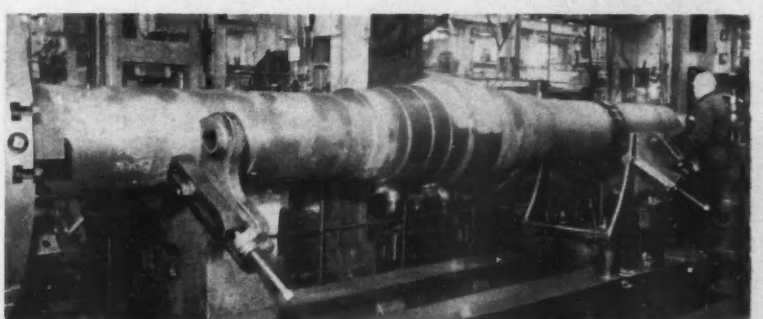
At home, deliveries continued on a high level and were 14% greater than a year earlier. New orders, however, were little higher than in June, 1960, and around 30% below the level of the earlier months this year when CEGB orders for new stations were playing a major part. As a result of these trends, the order book was slightly shorter than in May, but still 14% up on the June, 1960, level.

## N.S.W. adopts mouth-to-mouth resuscitation

ALREADY widely adopted in the USA, the mouth-to-mouth method of artificial respiration has now been adopted by the Electricity Commission of New South Wales as the official method to be used throughout the oganisation in dealing with people suffering from electric shock. The Commission's power station and distribution employees are now receiving instructions in the use of the method, which was described in our 17 March, 1960, issue.

## Black and Decker buy Italian factory

A LEADING Italian manufacturer of electrical power tools has been acquired by Black and Decker in a share exchange deal. The Italian company is Imobiliare Civatese SpA, whose manufacturing subsidiary, Star Utensili Electrici, operates an 86,000 sq ft plant at Civate, near Lake Como. Sales of Star products this year are put at £750,000. Black and Decker already have manufacturing and marketing organisations in France, Germany, Belgium, Switzerland and Scandinavia.



*The l.p. rotor shaft for Britain's first 275 MW steam turbine now being made at English Electric's Rugby works. This is one of two 275 MW single-line turbo-alternator sets being supplied by the company for the CEGB's Blyth "B" power station*

# Fareham Substation Site Inquiry

THE location of a new grid substation and bulk supply point near Fareham, Hants, which the Southern Electricity Board wish to establish, was the subject of a public inquiry earlier this month. The Board wanted the substation to be off Longfield Avenue, at the north west corner of *HMS Collingwood*, but Hampshire County Council refused planning permission on the ground that it would be detrimental to amenities of property of the nearby West End estate. It was pointed out that the original application was made in January, 1960, and lack of decision on the matter endangered development plans of local industry.

Mr A. H. Thomas, engineer in charge of the distribution system in the Board's No. 3 sub-area, said the substation was urgently needed because there was no room for expansion at Wymering. The new supply point would be used to boost supplies at Titchfield substation and a proposed station at Zetland Rd, Gosport. Work on two lines to Gosport had started, but could not be finished until they knew where the bulk supply point was to be. But if one of the lines was not finished by this time next year, supplies to Gosport would have to be restricted. The alternative site suggested, at Fort Fareham, would increase the cost from £200,000 by £54,000, and maintenance in the derelict fort would cost an extra £15,000 a year afterwards, he claimed.

Mr D. Miller, of Preece, Cardew and Rider, supported the Fort Fareham site because the ramparts would immediately and permanently screen the substation equipment. His estimates of costs put the increased initial outlay at a quarter of Mr Thomas's figure, and the annual cost at considerably less than £15,000.

Fareham UDC also supported the Fort Fareham site.

Mr J. A. Kent, who conducted the inquiry, adjourned the hearing until 7 Sept. in order to hear evidence from the Admiralty on the effect of the restricted radar zone.

## Southport Flower Show

AN experimental hot box in which chrysanthemum plants have been forced at the pace necessary to produce cuttings free from Aspermy virus was a feature of the joint stand of Manweb and EDA at the Southport Flower Show last week. Other sections dealt with early propagation of begonias by light therapy, hyacinths in bloom using electric light and heat as forcing agents, mist propagation, supplementary lighting for early cucumbers, and the familiar giant tomato plants grown at the North Western Electricity Board's nursery at Kendal.

An 11 ft by 8 ft wooden frame greenhouse, designed by a local firm for use with a standard electric installation, attracted many amateur gardeners.

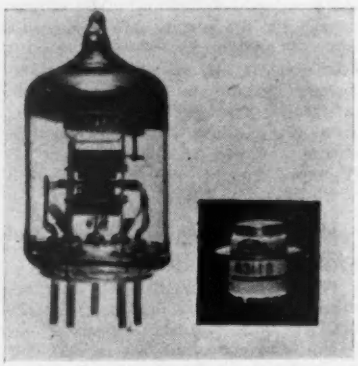
## DOUGLAS RESULTS

OVER 30·8 million units were sold in the Douglas area by the electricity undertaking of the Borough of Douglas, IoM, in the year ended 31 March last, an increase of some 2½ million on the previous year. Operations for the 12 months provided a balance of £5,735, which has been transferred to the reserve fund. The number of consumers increased by 54 to 9,895 and the maximum load rose to 10,150 kW.

Work is now proceeding on the dismantling of obsolete boiler plant and the preparation of foundations for the additional 2,200 kW diesel set now on order, which is expected to be installed towards the end of the coming financial year.

## Japanese use ceramics for valve manufacture

A BREAK-AWAY from the more usual glass construction of valves has been made by the Japanese firm of Toshiba—Tokyo Shibaura Electric Co.—who recently introduced a ceramic receiver valve. This follows the present-day trend for miniaturisation, being several times smaller than valves of comparable performance. It has the advantage of being able to be used for ultra-high-frequency communications work, anticipating the future when very high frequency waves for boadcasting will soon become saturated. Soon to go into mass production, these valves offer possible uses in the relay of international television broadcasting and in electronic computers and automation systems.



*A traditional tube (left) and a new ceramic tube (right), showing the relative sizes*

## ELECTRIC-LIVING FOR YACHTSMEN

AFTER the motel the boatel, and in a race against time SWEB engineers have just completed the electrical installation at Britain's first full-scale example. This is Dart Marina, a three-star riverside hotel for man and boat alike, which opened at Dartmouth last week. For the man there are many comforts of electric-living, with even the yacht moorings piped for electricity and water. For the boat there is a complete refuelling and chandlery service. It is also nice to know that one can hire a sailing dinghy.

The electrical installation is the largest of its kind yet carried out by SWEB's Kingsbridge branch, with a gleaming all-electric clubhouse kitchen and a three-floor laundry block demanding power. This comes from a 150 kVA 110,000/415-240 V transformer at the main entrance gates and terminates in a standard ironclad cut-out rated at 300 A/phase. The cut-out is mounted directly beneath a four-pole 200 A/pole busbar chamber, which in turn supplies a further four-pole 100 A/pole busbar feeding the main building.

The kitchen is a showpiece and includes three three-phase ranges, two grills, fish fryers, dishwashers, potato peelers, mixers, deep-freeze units and refrigerators, all controls being fitted with pilot lights. Each "cabin" has been fitted with a Chilton Mark IV shaver unit, while the lounge has an Ekco Thermopanel radiant glass panel heater built into a polished stone fireplace to supplement the central heating.

Lighting in all corridors is time-switch controlled, turning to half light from midnight to dawn.

**The hotbox shown at Southport for producing Aspermy virus-free chrysanthemum cuttings.**

## *Eire Electricians Strike*

A NEW pay offer by the employers side was rejected by electricians in Eire last week-end in a postal ballot. Raising the recommendation of the Labour Court, the employers offered 5s 7d an hour for electricians in Dublin, Cork, Limerick and Waterford, and 5s 6d an hour for those in the remainder of the country—a rise of 8d an hour, as against the Court's recommendation of 6d. This was in addition to a cut in the working week to 42 hours in Dublin and 45 hours elsewhere. The unions involved, the ETU (Ireland) and the Irish Engineering, Industrial and Electrical Trade Union, last Thursday decided against accepting the offer, and asked members, who went on strike on 21 August, to ballot on it.

The dispute only directly concerns those engaged in the contracting industry in Eire, plus some 400 men on maintenance and other operations with the Electricity Supply Board, but manual workers with the ESB also withdrew their labour last week in support of their own claim, and this caused some power supply difficulties.

## Vactric Control Equipment Expands

THE News of the World Organisation have lost no time in expanding the activities of Vactric Control Equipment Ltd., which they took over earlier this year. Substantial premises have now been acquired at Garth Rd, Morden, Surrey, and top priority is to be given to the erection of a new block to house the development and applied research departments.

Asked in what direction research and development were being taken, a spokesman for Vactric Control Equipment said facilities were being expanded with the long term in view, but present efforts were concerned with widening the existing range of products. These include precision electrical-servo components, high-speed programme switches and other specialist devices, the majority of which end up in military and civil aircraft and missiles, though some are also used in nuclear power applications.

## *Sayings* OF THE WEEK

*"Has anybody thought, for example, what is going to happen to towns like Colchester, Ipswich, Chelmsford and Norwich, now that electrification of the railway is going to open them up?"* . . . JOHN BETJEMAN, in an interview in the *Daily Mail*.

*"Equipment has been developed which can be attached to the undercarriage of cars to control their steering, acceleration and braking. . . . On such an electronic highway accidents could be virtually eliminated."* . . . MR HODGES, Secretary of Commerce, addressing World Traffic Engineering Conference, at Washington, USA.

## PRICES of cable metals and other materials

***Figures quoted are the official prices ruling on Tuesday, August 29***

| | £ per ton | Weekly change £ |
|---|---|---|
| COPPER, standard class A (settlement) ... | 232½ | +½ |
| " (3 months) ... ... | 235½ | +½ |
| LEAD, refined pig, 99·97% purity (cash) ... ... ... | 65½ | +1½ |
| " (3 months) ... ... ... | 67¼ | +1½ |
| TIN, refined, min. 99·75% purity (settlement) ... ... | 992 | +44½ |
| (3 months) ... ... ... | 993 | +45½ |
| ALUMINIUM, ingots 99·99·5% ... | 186 | — |
| " wire bars (4×4×54") | 193½ | — |
| BRASS Strip 63/37 ... ... ... | 198½ | — |
| SILVER (Troy oz) ... ... ... | 79⅜d | — |

| | £ per ton | Weekly change £ |
|---|---|---|
| ZINC, virgin, min. 98% purity (cash) ... ... ... | 75½ | +½ |
| " (3 months)... ... ... | 76½ | +½ |
| RUBBER, per lb No. 1, RSS. spot ... ... | 25½d | −⅛d |
| c.i.f. basis, ports. Nov. ... | 25½d | −⅛d |
| ARMOURING: Galv. Steel Wire (0·104 in.) ... | 68½ | — |
| Mild Steel Tape (0·04 in.) ... | 53½* | — |
| NICKEL (home) ... ... ... | 660 | — |
| MERCURY (76 lb flask) ... ... | 63 | — |
| AMERICAN PRICES: Copper, electrolytic (per lb) ... | 31c | — |
| Lead (New York) ... ... | 11c | — |

* *Tape Price, now an average, includes varnishing*

## A.E.I. WIN STEEL MILL ORDERS WORTH £500,000

TWO orders for electrical equipment which AEI have just received from separate steelmakers have an aggregate value of nearly £500,000. The larger of the two is from Dorman Long, to supply the electric drive for a blooming and slabbing mill which Dorman Long are erecting alongside their existing universal beam mill at Lackenby. The new drive consists of two 5,000 h.p. motors driving top and bottom mill rolls independently. Supply for the motors will come from grid controlled reversing rectifiers. The value of this order is approximately £450,000 and Dorman Long have yet to place the orders for the mill's auxiliary motors, control gear, switchgear and electrical distribution equipment.

AEI's other order comes from Stewarts and Lloyds, who have ordered equipment worth £45,000 for the modernisation of a continuous weld mill at Corby. As a result, capacity will be increased to 750 ft/min of 1¼ in. steel tubing or 320 ft/min of 4 in. tubing. The work will involve the replacement of the present mill saw with a special American type of flying saw which, in turn, calls for more powerful electrical equipment having wide and easily controlled speed variation, together with an electronic device for matching saw performance with that of a selected mill stand.

**The flying saw will be driven by a 25 h.p. a.c. mains powered motor, but to facilitate overall operational speed control of the mill, and achieve greater accuracy of pipe length cuttings, direct current will be used to power all seven of the actual d.c. mill motors and the d.c. saw crank motor.**

This direct current will be provided by an AEI type Ward-Leonard motor-generator set comprising a 400 h.p. mains powered a.c. synchronous motor driving a 220 kW d.c. generator, with a 40 kW constant voltage exciter, and a small 10 kW "booster" generator. Six of the eight 40 h.p. d.c. motors will drive mill stands, one the saw crank, and one the back-end roll when this is in use in conjunction with the pre-heating of strip.

Another AEI order comes from S of Scotland EB. This is to supply and install cables and the supporting steelwork for two 200 MW sets at Kincardine "B." The cable will include 11 kV and lower voltage paper and cambric insulated types and 250 V p.v.c. insulated cables.

## *Tin Over £990 a Ton*

RISING £100 since June, the price of tin topped the £990 a ton mark on Tuesday, an increase of over £40 in a week. Many dealers are attributing this great increase to the activities of speculators.

## News in Brief

At the August meeting of the ASEE Golfing Society at Bush Hill Park the GEC trophy was won by W. J. C. Stewart, with C. S. Penny runner-up.

The Standing Committee has recommended to the Board of Trade that imported cigarette, cigar and pipe lighters, whether operated by mechanical, chemical or electrical means, should bear indication of origin on each lighter and on any display card or carton. It is recommended that the Order in Council should come into force 12 months after it is made.

Nearly 10,000 people visited South of Scotland Electricity Board generating stations during "Scottish Week." Of these, 5,078 went to Kincardine and 2,613 to Portobello.

A new power signal box at Edge Hill, Liverpool, was put into service by the London Midland Region, British Railways, last Monday. The installation marks the removal of the last remaining main line semaphore signals between Crewe and Liverpool.

Benjamin Electric will open new Scottish area offices at 259 St. Vincent St, Glasgow C.2, next Tuesday.

AEI are staging an exhibition of industrial electronic equipment in conjunction with MANWEB at the Board's Industrial Development Centre, 83 Paradise St, Liverpool, from 2 Oct. to 6 Oct.

# OVERSEAS NEWS

from our correspondents abroad

## CANADA

### Niagara Control

An immediate start is to be made on a $7,000,000 extension to the international control dam on the Niagara River, the Hydro-Electric Power Commission of Ontario has announced. This follows final approval by the International Joint Commission which recently heard the application by HEPC and the Power Authority of the State of New York. The extension will add five 100-ft wide sluices and gates to the existing 13-gate control dam which was completed in 1957. It will control water levels in the Chippawa-Grass Island pool, headpond area for Canadian and US generating stations on the Niagara River. With the completion in 1962 of the Robert Moses Niagara power plant being built by PASNY, the existing dam would have been inadequate to maintain the required water levels. The extension will also solve the problem HEPC has been facing with ice plugging water intakes at generating plants, hampering their economic production of electricity. Two guide walls parallel to the Canadian shore extending 1,700 ft upstream and about 2,000 ft downstream from the dam will be built to cope with ice. The upstream wall will prevent ice from collecting at the main Canadian intakes and the downstream wall will direct ice into the Cascades section of the falls. The addition will be built by Ontario Hydro with PASNY sharing the costs. It is expected to be completed by the summer of 1963.

### Shrum Report

The assessment by the British Columbia Energy Board that public power costs less than private power, contained in a report recently presented by chairman G. M. Shrum, is regarded in Toronto as a vital clue to the decision of Premier Bennett to take over the British Columbia Electric Co. and the Peace River Development Co. The Energy Board now estimate that the delivered cost of Peace River power, if developed by private financing, would be 6·59 mills/kWh. If it were financed as a public undertaking the cost would be 4·37 mills at the basic load growth estimated to 1985. Cost of Columbia power development is estimated at 4·40 mills. The report concludes that if the two projects were developed under the same conditions of financing load growth and load factors, the difference in the cost of Columbia power and that for Peace River would be "practically indistinguishable." One member of the Board, Mr H. F. Angus, who is chairman of the Public Utilities Commission, dissented on the cost estimates. The Board stress that either the Peace or Columbia could produce more power than British Columbia itself would need in the early years, and it would be essential to find a large market at remunerative prices outside the province for the additional power. Thus advocating power exports, the Board urge the Federal Government to remove the present 0·3 mill/hr export tax.

## COLOMBIA

### Aiding Manufacture

Expansion of local manufacture of certain types of electrical equipment is arranged for under a $500,000 investment by the International Finance Corporation in Electromanufacturas, SA (EMSA), of Bogota, Colombia. Since 1958, EMSA has been producing welding electrodes under licence from the Westinghouse Electric International Co. Through a recently formed subsidiary, Electroindustrias, SA, they will produce a new line, including such items as fuse cut-outs, lightning arresters, capacitors and welding equipment. Some of these are already in limited production. Total cost of the expansion is estimated at $890,000 for new buildings, equipment, and working capital. The financing required in addition to the IFC investment is being provided by shareholders. The IFC investment of $500,000 will be repayable partly in US dollars and partly in Colombian pesos. It will be represented by unsecured notes yielding 8% interest. The dollar notes will mature between 1965 and 1968; the peso notes, between 1968 and 1970. IFC will also receive an option to purchase shares in the parent company. The IFC commitment is subject to completion of the necessary legal formalities.

## EGYPT

### Aswan Contract

A contract for specialised work by Soviet organisations on the Aswan hydro project was signed in Cairo recently. Under the contract, the USSR, in the period of the construction of the first section of the Aswan High Dam scheme (1961-64), undertakes the following: (a) The hydro-mechanical work necessary for the construction of a temporary dyke at the entrance to the canal, and the work of sluicing up the first stage of the dam in the amount of 9,240,000 cu metres; (b) the work of reinforcing the rock foundation of the dam against water seepage, including 93,700 cu metres of drilling work, and other operations; (c) the building of six hydraulic pressure tunnels each 240 metres long, and other tunnels; together with the assembly of metal reinforcements. The contract also provides for additional commitments by Soviet organisations for the delivery of equipment and machinery for the project, the assembly of a 380-mile kV power transmission line from Aswan to Cairo, and the assembly of the station's equipment. Total cost of the work is estimated at over 11 million roubles. Under the contract, 570 Soviet specialists will participate in the construction of the first stage of the Aswan project.

## INDIA

### Next Tata Plan

The Tata hydro-electric group is exploring the possibility of installing a fourth unit in Trombay with a rated capacity of 125 MW at an estimated cost of Rs12 crore. Referring to this project, the group's chairman, Mr J. D. Choksi, has told shareholders that the Maharashtra Government has informed the companies that they can proceed with the project for expansion at Trombay. The group is applying for a loan to the US Development Loan Fund for the foreign exchange component of the Trombay fourth unit project which will amount to 70% of the total cost of the project. The Government of India is being requested to sponsor the application. Their aim is to bring the fourth unit into operation before the end of 1964. Meanwhile, Mr Choksi is not without hope that the Electricity (Supply) Act will be so amended as to improve the return to electricity companies, which is now limited to 6%. Moreover, the licences of the Tata electric companies are valid only up to 1975. However, the State Government has informed the companies that it might be possible for the Government to consider a short extension of their licences.

### Delhi's Supplies

The Minister for Irrigation and Power is to appoint a committee to investigate the causes of the frequent power failures around Delhi, the capital. The committee will inquire into the adequacy of the arrangements made by the Delhi Electric Supply Undertaking, the New Delhi Municipal Committee and other licensees in Delhi to meet the rising power demand in the Union Territory. The Minister told the Lok Sabha earlier this month that the total power available to the DESU at present was 83,900 kW, but the average daily load demand varied from 85,000 kW to 90,000 kW. He referred to four steps being taken to augment the undertaking's capacity: (a) A 30,000 kW steam generating power house is under construction, it is scheduled to be completed by September-October, 1963; (b) a 15,000 kW set is proposed to be installed by September-October, 1963. Tenders for the plant have been invited;

(c) an additional 5,000 kW of power from the Bhakra-Nangal system is expected to be received by November, 1961; (d) another 20,000 kW of power from Bhakra-Nangal is expected to be received in June, 1962; (e) some new sets are planned to be installed at Bhakra and commissioned by the end of 1965-66.

### First Home-built Loco

The first electric locomotive built in India is scheduled for completion at the Chittaranjan workshop this month. It is the first of 10 d.c. locomotives for which only the electrical equipment has been obtained overseas. The workshops are intended to build, eventually, 60 electric locomotives each year.

### Power Loan

The Government of India and of the USA have signed agreements covering US loans totalling $62·9 million (about Rs30 crore) for three power projects which will together generate over 750,000 kW. The projects concerned are the second stage of the Sharavati hydro-electric project (Mysore State), the thermal power stations at Talcher (Orissa) and Amlai (Madhya Pradesh).

### Nuclear Policy

Explaining the Indian Government's policy on nuclear power, Mr Nehru told the Lok Sabha earlier this month that the high power committee now at work to select a site for the proposed nuclear power station in the Punjab-Delhi-Rajasthan-U.P. region would also make provisional recommendations for suitable sites for future projects. Tenders had already been invited for the construction of the first nuclear power station at Tarapore in Maharashtra and the second station would be set up in collaboration with Canada for experimental purposes somewhere in the general area of Punjab-Delhi-Rajasthan-U.P. There were other projects in the "thinking stage." The Prime Minister agreed to examine the suggestion for issuing a White Paper on the comparative cost of production of nuclear and conventional power. Such facts as were available showed that it was cheaper to produce nuclear power in certain parts of India which were remote from coalfields.

## PAKISTAN

### Karachi's Outlook

Plans of the Karachi Electric Supply Corporation to provide additional generating capacity should eliminate any power shortage in the capital after 1965. A 66 MW power station is now under construction at West Wharf, and when its two 33 MW sets come into operation in 1962, the demand should be met. There is likelihood of a brief period of power shortage between 1963 and 1964. This will be met from the proposed "C" power station, which will be built at Korangi. The "C" power station would comprise two 66,000 kW sets which will be commissioned in the first half of 1965. With an eye on the future power demand, it has been decided to install two more 66,000 kW sets at Korangi site. One of these will be commissioned in 1967 and the other in 1969-70.

## AUSTRALIA

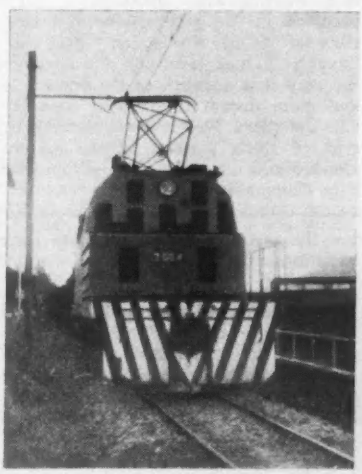
### Queensland Investigation

Will Brisbane City Council ultimately lose the power generation side of its Electricity Department? The question has been aired many times in recent years and now a number of the city's Aldermen seem to regard the transfer as inevitable. The matter is expected to be incorporated in an investigation now being conducted by representatives of the State Electricity Commission, the City Council, and the Southern Electric Authority, into the future of power supply in south eastern Queensland. The investigation began late last year and their report is expected next month. The State Electricity commissioner (Mr Neil Smith) has always favoured the combining of the power supplies of the two authorities, to make overall savings in generation costs. In his annual report to Parliament last year, he said that Government consultants, Merz and McLellan, had estimated that the combining of the two supplies would save as much as £50,000 a year in 1961, rising to £170,000 a year by 1965. Mr Smith is the chairman of the investigating committee. If Brisbane City Council lost its power stations at Tennyson and New Farm, it might still be allowed to operate as a distribution authority, taking a bulk supply, and officials of the Electricity Department consider a profit could still be made.

### Cable Contract for Japan

A contract valued at £A1 million, for the supply and laying of three underwater h.v. cables across Botany Bay, Sydney, has been awarded to Mitsui and Co. Australia Pty. Ltd. who are acting for the Sumitomo Cable Co., of Japan. The contract was placed by the Electricity Commission of New South Wales. The submarine section is 1¼ miles long. The cables will be operated at 132 kV, each circuit having a capacity of 120 kW. With single-core, oil-filled cables for each three-phase circuit, there will be nine power cables in service plus one spare on the submarine section, in addition to two pilot cables. The line will run underground for 4½ miles from an outdoor switchyard at Bunnerong to a new switching station at Kurnell, linking there with o.h. lines to the 33 kV Sydney south distribution centre. The project is to be completed in the first half of 1962.

# Railway Electrification in Katanga



The Kolwezi-Mutshatsha section on the Lobito route, a distance of 157 km, is the next for electrification by the Katanga railway concern, Compagnie du Chemin de Fer du Bas-Congo au Katanga (BCK). It will operate at 25 kV, 50 cycles, single-phase. Power will be obtained from the 110 kV system of Union Miniere du Haut-Katanga and stepped down to 25 kV for a.c. traction in an existing substation at Metalkat, and in a new substation to be built at Kayemba 109 km to the west. The BCK traction units operate from an overhead catenary system. The catenary wires are of 0·164 sq in. cadmium bronze and the contact wire is 0·13 sq in. copper and these are suspended from steel masts. The route is intended to be in commission in November, 1962, work on the scheme having started last May.

*Left, one of the traction units. Below, the catenary system adopted*

# Company Activities

UNTIL the bar opens, I am told by one qualified to know, appreciable numbers of the stockbroking fraternity sit now around the "House," transistor radio sets to hand, hearkening unto the cricket scores. With clients far away from the City searching the sun in holiday parts, business is something more than slack.

Not even the prospects for much-bought-by-brokers transistor radio sets bestirs the market in radio shares. Nor did the announcement that record crowds are trooping to this year's Radio Show at Earls Court. That the trade in transistor radios continues to boom is well enough known, and it might be added for the benefit of fashion-followers that in the United States some 179 million sets of this type have already been sold. That makes it about one set for every American man, woman and child. Here in the UK, the proportion so far achieved is about one set for every 250 persons. There is only one catch from the investor's angle: the radio makers are doing so badly on the television side. This particular problem was strongly spotlighted last week by the latest report from Philips Lamps. Not only is the 3% increase in turnover lower than that envisaged in the 1960 annual report, but it is directly due to the fall-off in television sales not only in Britain but also in Germany, Sweden, Norway and Australia.

There are, however, signs that not all is gloom. Philips have, for example, found that the sale of TV sets in Britain showed a marked recovery in May, June and July and the board still sticks to its forecast that 1961 sales are going to top the 5,000 million guilder, or, roughly, the £500 million mark.

Meanwhile, how did the shares of British radio and TV makers show up in the first week of the Radio Show? Not very brightly. GEC, which now owns Radio and Allied Holdings—the name behind "McMichael" and "Sobell" sets—fell from 29s 3d to touch a new 1961 "low" of 28s 9d. Decca dropped 9d to 63s 3d while British Electronic Industries, which now combines Pye with E. K. Cole, marked time at 9s 10½d. Thorn also held steady at around 51s.

Elsewhere in the electrical market, fireworks were provided by Dimplex, who saw their 5s Ordinary shares rocket from 76s 10½d to 84s on American buying and takeover whispers, but an "I know nothing" from chairman Mr E. J. Wade brought the shares whistling down again to 77s 3d.

Birmingham Sound Reproducers ("Monarch" record changers), despite the unchanged 10% interim dividend, spun up from 35s to 36s 9d and then back to 36s 3d on news that it has suspended its refrigerator project and that, anyway, the company is fully occupied in the gramophone and tape recorder fields. Production here continues at a high level and the directors say they look forward to the immediate and more distant future with considerable optimism. That is more than can be said of stock markets at the present clouded and uncertain time.—*From Our City Correspondent.*

### Birmingham Sound Reproducers

The board has decided to conform to the wishes of the Government and not increase the dividend, so the interim payment stays at 10%. Directors have also decided to suspend their refrigerator project (see page 309).

### A. C. Cossor

With the formal bid from Raytheon is the statement that Cossor incurred a group loss of £443,285 in the year to 31 March. But there is every reason to hope for a small profit this year, says Sir Miles Graham.

### Edwards High Vacuum

Shareholders took up 99·2% of the recent rights issue at 21s a share. The remaining 6,724 shares have been sold and proceeds less subscription money will be distributed to the entitled shareholders.

### Efco

The three recently formed associated companies appear to be approaching a profitable basis, says Mr D. F. Campbell in his annual review. On the group prospects, he says forecasting is difficult, but the last five months indicate little variation in new orders.

### Eleco

Dividend is effectively doubled and profits are well up to expectations. Directors have declared a final dividend of 13¼% to make 25% for the 15 months to 30 June, 1961. Of this total, 20% was paid on capital raised by a one-for-one scrip issue, whereas the pre-issue rate was also 20%. Group profits, including 15 months' trading of the parent and two years of Bell and Webster Industries, acquired in 1959, total £328,564, against £136,111 previously.

### Hackbridge Holdings

Despite "increasingly difficult" trading conditions, trading profit has been lifted from £276,777 to £299,969 for the year to 31 March. Dividend is maintained at 10%.

### International Combustion

Directors have repeated their warning that profits for the 12 months to 30 Sept. are likely to be lower than last year, but they expect to maintain the 30% dividend rate and have declared a steady 10% interim.

### Kango Electric Hammers

Sales for the six months to June are nearly 20% higher than for the previous corresponding period, say directors, announcing a steady 7½% interim dividend.

### Newton Brothers (Derby)

Orders in hand are higher than last year and trading prospects have improved, says the chairman in his annual review. These factors influenced continuation of the 6% bonus element in the dividend for the past year, when production rose by 8%, but lower margins trimmed earnings from £109,288 to £97,408.

### Philips of Eindhoven

Even this giant's results have been considerably affected by the television recession. While sales of all products increased by 3% in the first six months of 1961, this was below the planned level, due to TV sales falling short of schedule in several countries. Nevertheles, group sales for 1961 are still expected to exceed 5,000 million guilder (£495 million). With trading profit slipping to 15·6% of turnover from 18·1% throughout 1960, net profit for the six months is down from 171 million guilders to 148 million guilders. At the end of June stocks represented 39% of yearly sales, against 32% a year earlier.

### Plessey

Combined assets of Plessey-ATE-Ericsson, if the merger succeeds, would be around £50 million net, directors state in a letter convening a shareholders' meeting for 15 Sept. The meeting will consider resolutions to increase the board's borrowing powers to an amount equal to paid-up capital plus share premium account.

### Powell Duffryn

Two main points emerge on the electrical side of this diverse group's activities in the past year. The first is concern at the nuclear power cut-back and excess graphite machining capacity; the second is the growth and success of the heating and air-conditioning sector. The Carbon Products subsidiary is still heavily engaged on machining graphite for Hunterston, but with the order outlook thin is turning its efforts to developing its traditional products, particularly heat exchangers and other equipment for the chemical industry. Growth of heating and air-conditioning interests has warranted the formation of a new subsidiary, Powell Duffryn Heating Ltd.

### Sterling Industries

Details of the Cayzer proposals are not now expected before the end of October, but the offer of 1s 1½d for Ordinary shares and 21s for Preference will remain open for at least 14 days afterwards.

### Walker Crosweller

Last week's flotation found favour with investors, the 300,000 shares offered at 8s 6d each being oversubscribed between eight and nine times.

# COMMERCIAL INFORMATION

## Contracts Open at Home . . .

*Dates given are the final for receipt of tenders unless otherwise stated.*

**31 Aug.—Bala U.D.C.** 13 Group "A" steel columns and six wall brackets with 250 W mercury lamps/lanterns/gear.—Advertised 10 Aug. issue.

**31 Aug.—Enniskillen.** Electrical installation in proposed St. Michael's Grammar School extensions.—See 10 Aug. issue.

**31 Aug.—Hants C.C.** 13 35 ft steel columns complete with 200 W or 280 W sodium lighting for Bullington A303/A34 roundabout.—See 17 Aug. issue.

**31 Aug.—Lisburn.** Rewiring of lighting and heating installations in Railway St Presbyterian Church.—See 17 Aug. issue.

**1 Sept.—Belfast C.C.** 33 kV switchgear, together with modification of existing plant.—Advertised 3 Aug. issue.

**1 Sept.—East Riding C.C.** Electrical services installation in proposed Cottingham (Bacon Garth) Infants' School.—See 17 Aug. issue.

**1 Sept.—N. Armagh Hospitals.** Electrical work in Lurgan and Portadown Hospital alterations and additions.—See 3 Aug. issue.

**2 Sept.—Llanidloes B.C.** Electrical installation in new community centre. Town Clerk: J. E. Thomas.

**4 Sept.—Chatham B.C.** 1,080 Class "B" lighting units.—Advertised 10 Aug. issue.

**4 Sept.—Enniskillen R.D.C.** 159 fluorescent street lighting points.—See 24 Aug. issue.

**4 Sept.—Flint C.C.** Columns, lanterns/lamps/fittings for Queensferry By-pass lighting.—Advertised 17 Aug. issue.

**4 Sept.—Gt. Yarmouth C.B.C.** 2,000 g.p.m. at 45 ft head sea water pumps for use at swimming pool.—See 10 Aug. issue.

**4 Sept.—Maidstone B.C.** Provision and installation of fans in Public Baths, Fairmeadow. Borough Engineer, Palace Ave.

**4 Sept.—Rochdale C.B.C.** Rewiring of lighting and power installations in Oakenrod Primary School.—See 17 Aug. issue.

**4 Sept.—Wem R.D.C.** Electrical installations in six houses, Burnside. Surveyor: C. H. Jeffery, Council Offices, Wem, Salop.

**4 Sept.—West Riding C.C.** Maintenance of roundabout and traffic island lighting.—Advertised 24 Aug. issue.

**5 Sept.—Athlone U.D.C.** Two pumps with capacity of 11 cu ft p.m. for main drainage pumping plant.—See 3 Aug. issue.

**5 Sept.—Cardiff C.C.** Electrical installation in Adamsdown County Primary School.—See 10 Aug. issue.

**5 Sept.—Cardiff C.C.** Electrical installation, on fixed-price basis, in Leckwith Technical High School, Lawrenny Ave.—See 24 Aug. issue.

**5 Sept.—Oldbury B.C.** 154 Class "B" concrete columns, post-top lanterns/lamps/gear/time switches.—See 24 Aug. issue.

**5 Sept.—West Riding C.C.** Installation of road lighting at Tadcaster Toulston Lodge Secondary School.—See 10 Aug. issue.

**6 Sept.—Bath C.C.** Rewiring of 88 flats at Kingsmead. City and Waterworks Engineer, Guildhall. Deposit £2 2s. N.I.C./E.C.A. firms only.—Advertised in this issue.

**6 Sept.—Carshalton U.D.C.** Supply and erection of 556 15 ft concrete columns, 26 with sodium and 530 with tungsten lighting. Engineer and Surveyor, Stone Court, The Grove.

**6 Sept.—Leeds Hospital Board.** (Contract B). Electrical installation in The Lloyd Hospital, Bridlington. Applications to Regional Engineer, Park Pde, Harrogate, by above date. Deposit £2 2s.

**6 Sept.—Preston C.B.C.** Contract 8. Electrical installations, on fixed-price basis, in eight shops, 13 maisonnettes and branch library, Savick estate.—See 17 Aug. issue.

**6 Sept.—Staines U.D.C.** 190 Group "A" steel columns with 250 W mercury lanterns; 190 Group "B" columns with tungsten lighting.—Advertised 10 Aug. issue.

**6 Sept.—Wigan B.C.** Electrical installations in: 166 Giants Hall, Beech Hill housing estate dwellings; 43 Laithwaite estate dwellings and three Warrington Rd police houses. Borough Engineer, Municipal Bldgs, Hewlett St. Deposit £1 1s.

**7 Sept.—Basingstoke B.C.** Installation of Group "A" fluorescent street lighting along 1,000 yd of A339. Borough Surveyor, London Rd. Deposit £2 2s.

**7 Sept.—Belfast C.C.** Electrical installation, Diagnostic Centre.—See 10 Aug. issue.

**7 Sept.—Belfast C.C.** (b) Electrical installation in Somerdale Boys' Secondary School, Somerdale Pk.—See 17 Aug. issue.

**7 Sept.—Glasgow C.C.** Supply of 5,000 mild steel bracket fittings for stair lighting.—See 24 Aug. issue.

**8 Sept.—Antrim R.D.C.** Supply and erection of fluorescent street lighting at Randalstown and Doagh. Clerk, The Steeple, Deposit £3 3s.

**8 Sept.—Rothwell U.D.C.** Scheme 1: nine 140 W sodium units; Scheme 2: 229 45/60 W sodium units with side entry lanterns; Scheme 3: 232 45 W sodium units with post-top lanterns.—See 24 Aug. issue.

**8 Sept.—Sheffield C.C.** Supply of lamps. Town Clerk, Town Hall.

**8 Sept.—Stockton-on-Tees B.C.** Supply of: (a) 13 Group "A" reinforced concrete columns and (b) 13 140 s.v.d. lamps, lanterns/gear.—Advertised 17 Aug. issue.

**9 Sept.—Prescot U.D.C.** 54 "A.E.I. Kirby" lanterns mounted on 15 ft "Concrete Utilities" columns, together with lamps/gear along various roads.—See 17 Aug. issue.

**9 Sept.—Wexford C.C.** Electrical installation in public health clinic, Enniscorthy.—See 10 Aug. issue.

**11 Sept.—Newcastle under Lyme B.C.** 35 Group "A" 200 W sodium lighting units, including conversion fittings for existing columns, etc., for A52 Tarporley/Tarvin trunk road.—Advertised 17 Aug. issue.

**11 Sept.—N. Ireland.** Standby generating set for Ministry of Home Affairs, Radio Workshops, Lislea Drive.—See 10 Aug. issue.

**11 Sept.—Portland U.D.C.** Electrical work in connection with the installation of pumping plant.—Advertised 24 Aug. issue.

**11 Sept.—Ripon C.C.** Supply/erection or supply only of 24 Class "A" fluorescent wall mounted and steel column mounted lighting units and 100 Class "B" concrete column units. City Engineer, Low Saint Agnesgate. Deposit £2 2s.

**11 Sept.—Thurrock U.D.C.** Applications invited for inclusion on select list.—Advertised 24 Aug. issue.

**11 Sept.—Uxbridge B.C.** Rewiring of lighting circuits and power installations in: contract 111: 150 houses, Hillingdon; contract 112: 152 houses, Hillingdon; and contract 113: 130 houses, Cowley.—Advertised 17 Aug. issue.

**11 Sept.—Whitefield U.D.C.** Supply and erection of 17 Group "A" concrete columns/sodium lamps/lanterns/gear, plus removal of existing lighting along Dales La, A667. Surveyor, Town Hall.

**12 Sept.—East Ham C.B.C.** (1) Supply and erection of concrete columns; (2) delivery and erection of street lighting equipment for 107 15 ft reinforced concrete columns, alternatively 70 25ft and 37 15 ft columns/lanterns/lamps/gear. Borough Engineer, Town Hall, E.6. Deposit £2 2s.

**12 Sept.—Sunderland C.B.C.** Electrical installations in 209 Town End Farm estate dwellings.—See 24 Aug. issue.

**14 Sept.—Sunderland C.B.C.** Electrical installations in (a) Training College extensions and (b) Hylton Red Hse Community Centre.—Advertised 17 Aug. issue.

**15 Sept.—Co. Armagh.** Electrical installations in Crossnaglen Voluntary Intermediate School and school meals accommodation.—See 24 Aug. issue.

**15 Sept.—Belfast.** Provision of lighting services in Arlington Hse, Windsor Ave, for Ashleigh Hse School. Details from consulting engineers, Barrett and Agnew, 423 Ravenhill Rd, Belfast. Deposit £5 5s.

**15 Sept.—Carrick-on-Shannon.** Lighting, electrical heating, etc., installations in new post office for Dept. of Posts and Telegraphs. Priomh Innealtoir, Rannog na gConarthai, Teach Liathdroma, An Caislean, Baile Atha Cliath.

**15 Sept.—Malvern U.D.C.** Erection of 298 Group "B" columns/lanterns and the provision of wiring/lamps. Surveyor and Water Engineer: C. C. Judson, Council Hse. Deposit £2 2s.

**15 Sept.—Rhayader P.C.** 900 yd Group "A" 140 W sodium lighting. Clerk, Rhayader, Radnorshire. Deposit £3 3s.

**16 Sept.—Cheshire C.C.** Applications invited for inclusion in select list.—See 24 Aug. issue.

**16 Sept.—East Barnet U.D.C.** Contract 953.

## Your Queries Answered

***Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries***

### *A Selection from the 102 queries answered this week*

**"Ultra Rapid" vegetable shredders**—makers of? L.B.—Ultra Rapid Machines (Scotland) Ltd., Dykehead St, Queenslie Industrial Estate, Glasgow E.3.

**"Relite" fluorescent tube regenerating machines**—suppliers of? M.G.—Bremar Co. Ltd., 1 Gt. Cumberland Pl, W.1.

**"Candell" lighting fittings**—makers of? T.E.—Candell Ltd., Riverside Wks, Broadmead Rd, Woodford, Essex.

**Garbage disposal units**—makers of? R.J.—Haigh Engineering Co. Ltd., Ross-on-Wye, Herefordshire; Kenwood Mfg. Co. Ltd., Hipley St, Woking, Surrey; W. and G. Sissons Ltd., St. Mary's Rd, Sheffield 2; The Imperial Machine Co., Victoria Wks, Edgware Rd, N.W.2; Wynebourne Electrical Products Ltd., 90-96 City Rd, E.C.1; Proops Bros. Ltd., 52 Tottenham Court Rd, W.1; John Thompson Instrument Co. Ltd., Tavistock Hse, East Woburn Walk, Tavistock Sq, W.C.1.

**Skirting board heaters**—makers of? R.E.—Dimplex Ltd., Millbrook, Southampton; Heatovent Electric Ltd., 306a Fulham Rd, W.10; Inferation Ltd., York Town Industrial Estate, Camberley, Surrey; F. H. Biddle Ltd., 16 Upper Grosvenor St, W.1; A. and R. Electric Co. Ltd., 1 Bruce Ave, Shepperton, Middx; Key Eng. Co. Ltd., Larkfield, Maidstone, Kent; Davis Sheet Metal Engineering Co. Ltd., Eleys Estate, Angel Rd, N.18.

(a)(i) Supply and erection of 60 30 ft steel columns/brackets; (a)(ii) removal of 55 existing mercury lanterns and uprooting of 62 steel trolley poles; (b) supply and fitting of 60 200 W linear sodium lamps/lanterns/gear; (c) wiring for A1000 Gt. North Rd lighting.—See 24 Aug. issue.

**16 Sept.—Morley B.C.** 52 140 W sodium street lighting units on 25 ft concrete columns (22 columns to support o.h. wiring) along A62.—Advertised 17 Aug. issue.

**18 Sept.—E.B. for N. Ireland.** Specification N.I.1638. Supply of two 200 kVA and two 300 kVA 3·3/0·4 kV transformers for Coolkeeragh Power Station.—See 27 July issue.

**18 Sept.—Poyton-with-Worth P.C.** 55 concrete columns and sodium lanterns for Class "A" street lighting.—Advertised 17 Aug. issue.

**19 Sept.—Musselburgh B.C.** Supply and erection of 13 15 ft and 15 25 ft concrete columns and for installation of mercury and sodium lighting.—See 24 Aug. issue.

**19 Sept.—Peterborough C.C.** Supply/erection of 600 mercury and sodium units on steel and concrete columns together with the removal of existing units. City Engineer, Town Hall. Deposit £2.

**25 Sept.—Lytham St. Annes B.C.** Supply and erection of nine new concrete columns, 85 c.i. columns, repositioning of 25 c.i. columns and renewal of 42 c.i. brackets on existing columns. Borough Surveyor, Town Hall.

**16 Oct.—E.B. for N. Ireland.** Contract N.I.1621. Low pressure pipework and valves at Coolkeeragh.—See 17 Aug. issue.

**No date stated—N. of Scotland H.E.B.** Supply of 16·5 MVA 132/11 kV transformer and auxiliary transformer for Nant Power Station.—Advertised 17 Aug. issue.

**No date stated—S. Manchester Hospitals.** Applications invited for inclusion in select list for electrical work and for the supply of cables, fittings, lamps and tubes. Group Supplies Officer, Withington Hospital, Manchester 20.

**No date stated—N. of Scotland.** Three-mile 132 kV single-circuit steel lower line in Argyll. Details from Merz and McLellan, 72a George St, Edinburgh 2.—Advertised in this issue.

# . . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

**11 Sept.—Pakistan.** Cable, wire, fuses, meters, switches, conductors, insulators, lighting fittings, etc. (31 items). Director of Supply, P.I.D.C. Hse, Motijheel, Dacca. B.o.T. (ESB/26773/61).*

**12 Sept.—America.** Two 100 MVA, 230/13·8 kV 3-ph. power transformers. Dept. of the Interior, Bonneville Power Administration, 1002 N.E. Holladay St, Portland. B.o.T. (ESB/27062/61).*

**12 Sept.—India.** 6·6/11 kV switchboards and current transformers. Director, Central Stores Purchase Dept, Government of Andhra Pradesh, Hyderabad, Dn. B.o.T. (ESB/27040/61).*

**12 Sept.—Thailand.** 60 lead acid battery train lighting sets. State Railways, Yod-se. B.o.T. (ESB/27057/61).*

**13 Sept.—Burma.** 42 coils 250 V 19/·052 v.i.r. cable and 300 yd p.i.l.c. 660 V 3-core 19/·064 cable. Director-General, Purchase Board, St. John's Rd, Rangoon. B.o.T. (ESB/27339/61).*

**18 Sept.—India.** Overhead travelling crane for Atomic Energy Establishment, Trombay. Purchase Division, Mohatta Bldg, Palton Rd, Bombay 1. B.o.T. (ESB/26736/61).*

**19 Sept.—America.** Nine dead-tank oil or air blast circuit-breakers. Dept. of the Interior, Bureau of Reclamation, Bldg 53, Denver Federal Center. B.o.T. (ESB/27366/61).*

**19 Sept.—New Zealand.** Two 15 MVA, 33/11 kV, three-phase transformers. Town Clerk, P.O. Box 2199, Wellington. B.o.T. (ESB/26779/61).*

**19 Sept.—New Zealand.** One 250 MVA, 11 kV, three-phase ten panel switchboard. Town Clerk, P.O. Box 2199, Wellington. B.o.T. (ESB/26780/61).*

**20 Sept.—Australia.** Lamps (28 items). Secretary, Victorian Railways, Melbourne C.1. B.o.T. (ESB/26745/61).*

**20 Sept.—India.** Transformer welding sets. Chief Purchase Officer, National Coal Development Corpn., Darbhanga Hse, Ranchi. B.o.T. (ESB/26756/61).*

**20 Sept.—Kuwait.** Iron-clad switch-fuses, isolating switches, change-over switches, cable sealing boxes. President, Dept. of Electricity, Water and Gas. B.o.T. (ESB/27319/61).*

**26 Sept.—Greece.** 10 kVA 3 ph. transformers. Office of State Purchases, 50 Socrates St, Athens. B.o.T. (ESB/27034/61).*

**28 Sept.—Pakistan.** 33 kV pin insulators. Executive Engineer, Stores Division, Electricity, W.A.P.D.A., Bharat Bldg, Lahore. B.o.T. (ESB/27311/61).*

**2 Oct.—Trinidad and Tobago.** All aluminium and a.c.s.r. conductors (five items in quantity ranges of 250,000 ft to 324 miles). Purchase Officer, Electricity Commission, P.O. Box 121, Port of Spain. B.o.T. (ESB/26419-23/61).*

**3 Oct.—India.** Substations for Wind Tunnel Centre, Belur and the main laboratory at Kodihalli. National Aeronautical Laboratory, 1 Jayamahal Rd, Bangalore. B.o.T. (ESB/27041/61).*

**10 Oct.—Ceylon.** 75 tons 7/·102; eight tons 7/·144 and eight tons 7/·161 s.c.a. conductors. Chairman, Tender Board, Ministry of Agriculture, Land, Irrigation and Power, P.O. Box 500, Colombo. B.o.T. (ESB/26726/61).*

**17 Oct.—Ceylon.** 18 ton 7/·110 and ten ton 7/·149 all-aluminium conductors. Crown Agents, 4 Millbank, S.W.1 B.o.T. (ESB/27397/61).*

**30 Oct.—Nigeria.** 90-mile 132 kV single-circuit transmission line, Aba/Umuahia/Oji River Power Station. Resident Engineer, Electricity Corpn. of Nigeria, Adelphi, John Adam St, W.C.2. Documents fee £12, a précis is also available.—Advertised in this issue.

**24 Nov.—Australia.** 30 MW turbo-alternator, condenser, feed heating and auxiliary equipment for Bulimba "B" Power Station. Chief Engineer, Southern E.A. of Queensland, Boundary St, Brisbane. B.o.T. (ESB/22020/61).*

**No date stated—Ghana.** Complete television system including studios, transmitters, microwave links, v.h.f. intercom. system and standby diesels. Details from Crown Agents, 4 Millbank, S.W.1. Fee £50. Reference EE2 Ghana 9515.

# CONTRACTS PLACED

**Bury B.C.** Electrical services in abattoir extensions, T. Tomlinson Ltd.

**Middlesbrough T.C.** Lighting improvement at Whinney Bank Boys' and Junior School, Doves Ltd., £533 12s.

**Scunthorpe B.C.** Electrical installations in Healey Rd shops/flats, F. R. Hammond, £1,140. Recommended.

**Whitby U.D.C.** Supply and erection of 131 Group "A" columns/250 W lanterns, General Electric Co. Ltd.

**Wolverhampton B.C.** Rewiring of: Penn Secondary School, Midlands Electricity Board, £2,133; and St. Patrick's R.C. School, C. A. and W. J. Postings, £1,099.

# TRADE MARKS

*This information is extracted from the Official Journal by permission of the Controller.*

**Acorn.** 814,052. Class 9. Monitoring, indicating and recording apparatus, etc. De Haviland Aircraft Co. Ltd., Hatfield Aerodrome, Hatfield, Herts.

**Aerialite Trav-ler.** 813,942. Class 9. Apparatus, etc. Aerialite Ltd., Castle Wks, Stalybridge, Ches.

**Fanfare.** 821,920. Class 11. Clothes drying cabinets. Aerialite Ltd., Castle Wks, Stalybridge, Ches.

**Industronics.** 816,230. Class 9. Apparatus, etc. Wharton Electronics Ltd., 57 Cadogan Sq, S.W.1.

**Isopad.** 818,393. Class 11. Heating apparatus, etc. Isopad Ltd., Barnet By-pass, Boreham Wood, Herts.

**Loblite Presmalite.** B805,346. Class 11. Bulkhead fittings, etc. Loblite Ltd., Third Ave, Team Valley, Gateshead-on-Tyne 11.

**Slimra.** 816,432. Class 11. Heating and drying apparatus, etc. P. and R. Electrical (London) Ltd., 1 Berrymead Gdns, W.3.

**Solartron.** 816,469. Class 11. All goods. Solartron Electronic Gp Ltd., Solartron Wks, Queens Rd, Thames Ditton, Surrey.

**Sonac.** B814,581. Class 9. Apparatus, utilising ultrasonic waves for detecting and determining the proximity of objects or materials, etc. Delavan Mnfg. Co., Grand Ave and Fourth St, Des Moines, Iowa, U.S.A.

**Valor** in design. 819,104. Class 11, Appliances, etc. Valor Co. Ltd., Bromford, Erdington, Birmingham 24.

**Viscomex.** 820,825. Class 9. Electronic apparatus for controlling the viscosity of ink in printing presses. J. F. Crosfield Ltd., 2 Elthorne Rd, N.19.

**Waste King.** 806,367. Class 7. Dishwashing and laundry machines. Waste King Corpn., 3300 East 50th St, Los Angeles, California, U.S.A.

# TRADE NOTES

**Changes of Address.** As from 6 Sept. Copes Regulators Ltd. will move to new offices at 307-8 High Holborn, W.C.1. The Telephone No. remains Chancery 7075.

C. A. Parsons and Co. Ltd. London office is now at 40 Broadway, Westminster, S.W.1. Telephone: Whitehall 3984.

As from 1 Sept. the address of Powerlite Electrical Installations Ltd. will be Victoria Grove Wks, Victoria Grove, Stoke Newington, N.16. Telephone: Clissold 4736.

**Expansion.** Hedin Ltd., of South Woodford, have taken over additional office and works accommodation at Fowler Rd, Hainault, Essex. Manufacture of their industrial heating elements and resistances will continue to be carried out at South Woodford, whilst furnaces and ovens will be made at Hainault.

Isherwoods have opened a new electrical, radio and TV retail store in Attercliffe Rd, Sheffield.

The Aircraft Electrical Division of the Plessey Co. Ltd. has started operations in the £507,000 factory at Eastern Ave, Romford, which was acquired from Regentone Products Ltd. in May.

**Service Branch.** Black and Decker Ltd. have opened a new service branch at 1 Brixton Rd, S.W.9.

**Sheffield Office.** George Kent Ltd. have opened a district office at Lloyds Bank Chmbrs, Earl St, Sheffield 1. Telephone: Sheffield 77471.

**Uruguay Imports.** A surcharge of 75% has now been imposed by Uruguay on imports of electric lighting tackle up to 5,000 kilos load capacity, with or without electric or manual trolley.

**U.S. Factory.** Ferranti Electric Inc., of New York, have opened a new $350,000 factory at Plainview, Long Island, New York.

# BUSINESS PROSPECTS

**Aylesford.** New research and development centre for the Reed Paper Group. Contractors: James Miller and Ptnrs., 7 Suffolk St, S.W.1. Cost: about £500,000.

**Belfast C.C.** Tender: 16 houses, Mountcollyer St. City Architect.

**Birmingham.** Regional Hospital Board, Edgbaston, propose extensions to pathological laboratory, Little Bromwich General Hospital; £54,400. C.C. Tender: 32 dwellings, Willis St. City Architect.

**Blackpool.** Planned: shops and flats, the Promenade and Cocker Sq, for M. Stratton, c/o 32 Edward St.

**Blyth.** R. A. Gofton and Son Ltd., Front St, Monkseaton, propose houses/shops Fountains Head Bank. W. Leech Ltd., St. James's St, Newcastle, propose 20 dwellings/shops/flats, Tynedale Dr. T.C. propose 22 houses, Kitty Brewster Rd; engineer.

**Bournemouth.** B.C. propose 180 dwellings, Turbary Common. Architect.

**Brighouse B.C.** Tender: dust extraction equipment, either mechanical or vacuum for refuse wks. Cleansing Officer.

**Bristol.** John Laing Construction Ltd., Bristol, awarded £325,000 contract for extensions to Bristol Dental Hospital, for United Bristol Hospitals; architects: W. H. Watkins, Gray and Ptnrs., 8 Colston Ave. Proposed: store at 60-66 East St, Bedminster, for Marks and Spencer Ltd., Michael Hse, Baker St, W.1.

**Cardiff.** Capital and Counties Property Co. Ltd., 4 Lloyd's Ave, E.C.3, placed a contract for first stage development of a shopping centre with offices, The Hayes. Cost: £346,352; contractors: Tersons Ltd., Dollis Pk, N.3. C.C. Tender: Hall of residence for Welsh College of Advanced Technology, Llanedyern; City Architect.

**Chester.** Barclays Bank Ltd., 54 Lombard St, E.C.3, propose offices at St. Werbergh St and Northgate St.

**Christchurch.** Larches Estates Ltd., Christchurch, propose shops/flats, High St.

**Cumberland.** C.C. propose £162,000 secondary school, Longtown. County Architect, Portland Sq, Carlisle.

**Doncaster.** Proposed: printing works at Holly St, for R. L. Crowther Ltd. Town and City Properties Ltd., propose shops/showrooms, Reindeer Hotel site, Hall Gate. Patchings Ltd., bldrs., contractors for proposed Industrial and Investment Services Ltd., 20 shops, 30 offices, East Laith St.

**Falkirk.** Factory at Burnbank Rd is planned for William Milne (Falkirk) Ltd., 1 Meeks Rd.

**Farnborough.** Proposed by H. H. Hilder Ltd., Farnborough, eight shops, 12 flats, workshop and car park at Farnborough Rd, to cost £80,000.

**Felling U.D.C.** Tender: 18 traditional bungalows, Keir Hardie Ave, Wardley. Surveyor.

**Fife C.C.** Tender: 45 dwellings, various sites, Balmullo, Blairhall, Kinglassie. County Clerk, Cupar.

**Galway.** New factory proposed by Lee Cooper Ltd., Farringdon Ave, Harold Hill, Romford, Essex.

**Gateshead.** T.C. propose 38 old people's bungalows, Sheriff Hill estate. Engineer.

**Glasgow.** Planned: 11-storey block of flats and underground car park, 12 Cliveden Rd, for Copthall Holdings Ltd., 3 Red Pl, Mayfair, W.1. Proposed by Covell and Matthews, architects, 34 Sackville St, W.1, on behalf of Moss Empires Ltd., Cranbourn Mansions, W.C.2, for block of offices, shops, car park, etc., at 35 Sauchiehall St, C.2. Planned: shopping centre, junction of Muirend Rd and Clarkston Rd, S.4, for Grampian Properties Ltd., 144 St. Vincent St. Suite of shops, Paisley Rd West and adjoining, S.W.2, by Miller, Macrae and Stewart. Extensions to office block at 2 Cadogan St, C.2, for Scottish Daily Record and Sunday Mail Ltd.

**Greenford.** Eight shops and maisonnettes at 374-376 Oldfield La, planned by George, Davies and Webb, architects, 112 Jermyn St, S.W.1.

**Guildford.** George Baines and Syborn, 121 Victoria St, S.W.1, architects for £1 million departmental store for Debenhams Ltd.

**Hemel Hempstead.** A multi-storey bowling centre, South Marlowes, is proposed by Transworld Bowling Ltd.; architects: Fuller, Hall and Foulsham, 212 High Holborn, W.C.1. Offices, Maxted Rd, proposed by G.E.C. Ltd., Magnet Hse, Kingsway, W.C.2; architects: Clifford, Tee and Gale, 5 Buckingham Palace Gdns, S.W.1.

**Hove B.C.** Tender: 52 flats, Hardwick Rd. Engineer.

**Huntingdon.** R.D.C. propose 42 dwellings in 1962 programme. Surveyor.

**Kingston upon Thames R.B.C.** Tender: 17 maisonnettes, Acre Rd. Clerk.

**Leeds.** Warehouse, offices at Kirkstall Rd industrial estate, proposed by Equitable Life Assurance Society Ltd., 19 Coleman St, E.C.2. Factory extensions at York St proposed for The Super Clothing Co. Ltd.; contractors: Techno Commercial Ltd., Brown La, Leeds 11. Regional Hospital Board Tender: cardiological department, Bardford Royal Infirmary.

**Leicester.** Proposed: at Vaughan Way and Blue Boar La, Davis Manufacturing Co. (Leicester) Ltd., 86 Highcross St, factory. Proposed: at Vaughan Way, Burgess St, by Kerry's (G.B.) Ltd., Warton Rd, E.15, showrooms, offices and stores. C.C. Tender: 156 flats, Glen Parva; City Architect.

**Lincoln.** Shops, offices and supermarket planned for Shop Construction Group, London W.1. Cost: £100,000. Architects: H. A. Halpern and Ptnrs., 58-60 Cannon St, E.C.4.

**Liverpool.** Proposed: printing works at Pall Mall for Duttons Ltd., 34 Pall Mall; contractors: Norwest Construction Co. Ltd., Ruthven Rd, Liverpool 21. Liverpool Regional Federation of Building Trades Employers propose lecture hall with offices at Hope St.

**Llandeilo R.D.C.** Tender: sewage works, including two pumping stations. Engineer.

**London.** New factory at Urswick Rd, Hackney, E., proposed by F. A. Reed and Ptnrs., surveyors, 10 Storey's Gate, S.W.1. Proposed: flatted factories at Caesar St by A. M. Tribich, architect, 51 Nethercourt Ave, N.3. Contract worth £150,000 placed for building three-storey block at Brewery Rd, Islington, N.7, for Woburn Studios Ltd., 9 Ormond Close, W.C.1; contractors: Holland & Hannen and Cubitts (G.B.) Ltd., Westminster, S.W.1. Planned: factory/warehouse/office at Catford Bridge Station, Lewisham, by Begbey and Meers, architects, 12 Pancras La, E.C.4. Industrial building proposed, 63-95 Glenthorne Rd, W.6; architects: Barnsley and Hewett, 26 Chalcot Sq, N.W.1. S.W. Metropolitan Regional Hospital Board. Eastbourne Terr, W.2, have given £62,019 contract to L. and W. Whitehead Ltd., 169 Clapham Rd, S.W.9, for building kitchen block at St. Mary Abbots Hospital, Kensington, W. Six-storey nurses' hostel planned at Holland Pk, W.8, for King Edward's Hospital Fund for London; £129,400 contract is placed with Patman and Fotheringham, Ltd., 15 Islington Pk St, N.1. Planned: tower block at City Rd, E.C.1, by G. Baines and Syborn, architects, 121 Victoria St, S.W.1. Shops and offices at 258 Euston Rd proposed to plans by Hutchinson and Mitchell, 37 Gt. James St, W.C.1. Offices and 44 flats planned at New Cavendish St, W.1, for Simo Properties Ltd., Imperial Hse, Dominion St, E.C.2; architects: Stone, Toms and Ptnrs., 28 South Audley St, W.1. Proposed: multi-storey office block with basement at Northfields Ave, W.13; architects: H. Darsa, 59a Connaught Gdns, W.2.

**Luton.** Factory and office premises proposed, Taylor St, for Harbey Smith Ltd.

**Manchester.** Three-storey block of shops and offices at Bent St, Cheetham, proposed for Soloman M. Sherman, Manchester. Planned: shops, offices at 257-261 Stretford Rd, Hulme, Sorenson Equipment Trust Ltd., Manchester.

**Middlesbrough.** A. E. Gray and Son Ltd., Tynedale St, Stockton, propose housing development on 26 acres, Tollesby. T.C. propose 130 houses, Easterside estate and 21 dwellings, Newport Rd; engineer.

**Newbury B.C.** Tender: improvement to swimming pool. Architects: Sutton, Griffin and Sweetman, 87 Northbrook St.

**Newcastle.** R. Turley and Asscts., 46 Jesmond Rd, architects for Geo. Bainbridge Ltd. proposed shops/dwellings, West Rd and Slatyford La.

**N. Ireland.** Min. of Commerce placed contract for extensions to factory of English Sewing Cotton Ltd., Lisnaskea, Co. Fermanagh. Contractors: Clarke and Sons Ltd., Lisnaskea.

**Nottingham.** Ericsson Telephones Ltd. will have buildings erected at Beeston by F. Perks and Son Ltd., Long Eaton, Notts. Extensions to factory at Nottingham Rd, New Basford, for Deroy Ltd.; contractors: J. Powell and Son (Bldrs) Ltd., 3 Barnston Rd.

**Oldham C.B.C.** Tender: 74 dwellings, Little Moor La. Surveyors: Cameron and Middelton, 21 Mumps.

**Pembroke Dock.** Factory, Ferry La, proposed by Industrial Estates Management Corpn. for Wales, Fforestfach, S. Wales. Contractors: W. Cowlin and Son Ltd., Penarth Rd, Cardiff.

**Ramsey U.D.C.** Tender: 18 traditional dwellings, School La estate. Architects: Everard, Keay and Gimson, 6 Millstone La, Leicester.

**Romford.** Extensions proposed for Precision Products Ltd., Viking Wks, London Rd. Contractors: J. Jarvis and Sons Ltd., 239 Vauxhall Bridge Rd, S.W.1.

**Ross-on-Wye R.D.C.** 14 dwellings, Three Crosses estate. E. F. Young, 2 Tivoli Lawn, Tivoli Rd, Cheltenham.

**Sale B.C.** Tender: 48 dwellings, Roebuck La. Engineer.

**Scunthorpe.** T.C. propose 360 dwellings in 16-storey block, Ashby Screeds. Surveyor.

**Southend.** Heron Group of Companies, 21 Chiswell St, E.C.2, propose 12-storey office block with 85,000 sq ft floor space at Victoria Ave. Architects: E. S. Boyer and Ptnrs., 88-90 Gray's Inn Rd, W.C.1.

**South Shields.** Industrial Estates Management Corpn., Team Valley, Gateshead, plan factory covering 40,000 sq ft. Architects: Jack Cotton, Ballard and Blow, 48 Pilgrim St, Newcastle.

**Stockton.** Premier Dwellings (Cleveland) Ltd., Albert Rd, Middlesbrough, propose multi-storey flats, South Rd, Norton. Moorhouse and Barker Ltd., bldrs., 100 Thornaby Rd, Thornaby-on-Tees, propose 159 houses, Lonesome Hall Farm estate. 32 houses, Hartburn Ave, proposed by Gray and Son Ltd., Tynesdale St. T.C. obtaining tenders for 57 dwellings, central area.; architect, Tees Land Investment Co. propose shops/offices, Bridge Rd, Park Terr.

**Surbiton.** Planned: extensions to factory and offices, Mount Rd, for J. L. Jameson Ltd. Extensions to factory, Cox La and Davis Rd, for Field Brothers, engineers. Warehouse/offices, Oakcroft Rd, for B.I.C.C. Ltd.

**Wakefield.** Extensions proposed, Providence Mills, Westgate, for George Lee and Sons Ltd. Contractors: A. Clifford Green Ltd., Market St.

**Wantage.** New factory covering 30,000 sq ft, Grove Rd, planned by Frank Cooper Ltd., 110 Botley Rd, Oxford.

**Warrington.** New factory proposed, Grappenhall, for Metro-Cutanit Ltd., Allen St. Architect: J. H. Cheetham, 3 Palmyra Sq.

**Watford.** Planned: three-storey bldg of shops and showrooms, 86 High St, for Property Management and Development Ltd.

**Wembley.** Dalling and Ptnrs., 14 Bloomsbury Sq, W.C.1, propose multi-storey shops, supermarket and office block. Shop and showrooms premises proposed for Graysons Ltd., 602 High Rd, Wembley; architects: Bostock and Ptnrs., Central Hall Bldgs, Station Approach, Southall.

# MEETINGS TO NOTE

**FRIDAY, 1 SEPT.**

A.S.E.E. (Liverpool and District). Chairman's address, J. R. Atkinson, Industrial Development Centre, M.A.N.W.E.B., Paradise St. 7.30 p.m.

**MONDAY, 4 SEPT.**

FARNBOROUGH FLYING DISPLAY AND EXHIBITION at Royal Aircraft Establishment, Farnborough, until 10 Sept.

A.S.E.E. (Halifax). "Railway Electrification," J. H. Leonard. Crown Hotel, Horton St. 7.45 p.m.

A.S.E.E. (Sheffield). Chairman's Address at Royal Victoria Hotel. 7.30 p.m.

A.S.E.E. (S. Essex). "The Durgapur Steel Works," J. A. Hill. The Angel Hotel, Ilford Broadway, Ilford. 8.15 p.m.

A.S.E.E. (S. Wales). "The Association," E. K. N. Brittain. South Wales Institute of Engineers, Park Pl, Cardiff. 7.30 p.m.

**TUESDAY, 5 SEPT.**

INSTITUTION OF PLANT ENGINEERS (London). "Lifts—Selection, Installation and Maintenance," C. F. Scholefield. Royal Society of Arts, John Adam St, W.C.2. 7 p.m.

A.S.E.E. (W. London). "The Role of the Electrical Consulting Engineer in Industry," W. H. Brooks. The White Hart, 49 King's Rd, Chelsea, S.W.3. 7.45 p.m.

A.S.E.E. (Reading and Districts). "Lighting in Offices," courtesy of the British Lighting Council. Caversham Social Club, Caversham, Reading. 7.30 p.m.

**WEDNESDAY, 6 SEPT.**

I.E.E. (Electronics and Communications). Conference on "Microwave Measurement Techniques," Savoy Pl, W.C.2, until 8 Sept.

A.S.E.E. (Manchester). Communal TV Distribution Systems," M. G. Flynn, North Western E.B. Service Centre Theatre, Town Hall Extension, St. Peter's Sq. 7.30 p.m.

A.S.E.E. (N. London). "The Conception of Electrical Contracting," G. G. Kitchener. Wood Green Civic Centre, N.22. 8 p.m.

A.S.E.E. (Preston). Dinner and Social Evening, Farmer's Arms Hotel, Market St, Preston.

**THURSDAY, 7 SEPT.**

A.S.E.E. (Bradford). "Lighting in Home and Industry," J. W. Howell. Midland Hotel. 7.30 p.m.

A.S.E.E. (Brighton, Hove and District). "Modern Trends in Coil Winding Wire," C. P. Fox. Cricketers Hotel, Black Lion St, Brighton 1. 7.30 p.m.

# Gazette Announcements

COMPANIES ACTS

**The Norman Wrigley Co. Ltd.** Creditors to send details to liquidator: G. H. Eaves, 47 Mosley St, Manchester 2, by 31 Aug.

**Bi-tapes Ltd.** Mr. A. C. Blake, 199 Piccadilly, W.1, appointed liquidator at extraordinary general meeting on 25 July for the purpose of voluntarily winding-up.

**Bransom Kent Ltd.** Mr. L. H. Cohen, 18 Harcourt Hse, 19 Cavendish Sq, W.1, appointed liquidator as from 4 Aug.

**Tone Electrical and Eng. Co. Ltd.** Meeting of creditors to be held at offices of Goodland Bull and Co., Bridgwater Hse, Corporation St, Taunton, on 5 Sept., at 2.30 p.m.

**W. J. Thompson (Electrical) Ltd.** Meeting of creditors to be held at 28 Mackenzie St, Slough, Bucks, on 31 Aug., at 2.45 p.m.

**F. E. White (Electrical) Ltd.** Mr. R. A. Haigh, Court Chmbrs, Friar La, Leicester, appointed liquidator at extraordinary general meeting on 11 Aug. for the purpose of voluntarily winding-up.

**Plasticators Ltd.** Mr. L. H. Shipton, 31 Lloyd St, Manchester 2, appointed liquidator at extraordinary general meeting on 15 Aug. for the purpose of voluntarily winding-up.

**P.L.D. (Electrical) Ltd.** Mr. A. T. Eaves, 47 Mosley St, Manchester 2, appointed liquidator at extraordinary general meeting on 17 Aug. for the purpose of voluntarily winding-up.

**Thornley Electrical Ltd.** Mr. A. J. Gray, 3 Manor Pl, Sunderland, appointed liquidator at extraordinary general meeting on 15 Aug. for the purpose of voluntarily winding-up.

**Articair Refrigeration Ltd.** Dividend per £: 5s 7½d payable at offices of liquidator, 4 Bucklersbury, Cheapside, E.C.4, on 1 Sept.

**W. R. S. Horne Ltd.** Liquidator, R. F. Bendall, 126 Colmore Row, Birmingham 3, released as from 7 July.

**Phipps and Culling (Products) Ltd.,** 43 High St, Addlestone, Surrey, electrical appliance distributors.

Creditors were informed by the Official Receiver that liabilities were estimated at £10,346, with assets as three refrigerators in the hands of third parties and about £75 which might be recoverable from a former salesman of the company.

The company, formed in April, 1960, dealt in electrical appliances, fittings and signs which were sold direct to the public via newspaper advertising. Activities commenced from 43 High St, Addlestone, and 407 Nether St, N.3. In June, 1960, it obtained offices at 37a Carfax, Horsham, Sussex, and shortly afterwards it obtained further premises at 44 High St, Chatham.

In July, 1960, the company obtained, according to a director, the sole selling rights in the U.K. of the "Sivia" refrigerator. (The company which supplied the refrigerators was the petitioning creditor in the liquidation.) The company purchased a large number of the refrigerators and some time later, according to Mr. Culling, a director, another dealer commenced a national advertising campaign offering the same refrigerator at about £6 cheaper than the company had purchased them from its supplier. He added that as a result the company's customers refused to keep up their hire purchase payments and finance houses debited the company's account. Money was also lost as a result of irregularities in respect of certain H.P. deals.

Business ceased altogether in October and a resolution was passed for voluntary liquidation. Subsequently the petition for compulsory winding-up was presented.

Creditors nominated Mr. J. S. Bradley-Hole, of 7 Old Steine, Brighton, as liquidator.

BANKRUPTCY ACTS

*Receiving Orders*

**High Court of Justice.** S. Lixenberg, electrical contractor, of 4 Forburg Rd, Stamford Hill, N.16. Receiving order dated 12 July.

**Rochester.** H. H. Blackwood, electrical goods retailer, formerly carrying on business at 231 Canterbury St, Gillingham. Receiving order dated 16 Aug.

**High Court of Justice.** F. Mielniczek, domestic electrical equipment dealer, formerly carrying on business at 261 Eversholt St, N.W.1. Receiving order dated 9 Aug.

**Sheffield.** J. T. Barnes, domestic appliance dealer, carrying on business as Farmer's Electrics at 153-155 Marshland Rd, Moorends, Thorne. Receiving order dated 15 Aug.

*Public Examination*

**Hanley and Stoke-on-Trent.** Electrical Homes (S-on-T), electrical appliance retailers and house furnishers, formerly carrying on business at 7 Glebe St, Stoke. Public examination: 2 Nov., at Town Hall, Hanley.

*Applications for Discharge*

**High Court of Justice.** C. R. Brown, electrical appliance wholesaler, formerly carrying on business in partnership as Brown Wholesale Electrics at 11 Churchill Walk, E.9. Order made on 13 July on application for discharge: discharged as from 14 July.

**Liverpool.** G. Dickinson and K. G. Dickinson, electricians, formerly carrying on business in partnership at 134 Clipsley La, and 321 Church Rd, Haydock. Order made on 28 July on application for discharge: discharged as from 28 Oct.

*Release of Trustee*

**High Court of Justice.** S. Ross, electrical dealer, formerly carrying on business as Jif Electrical Appliances and in partnership as Newington Electrics at 98 Matthias Rd, N.16. Trustee: E. C. Sherwood, Bankruptcy Bldgs, Carey St, released as from 2 Aug.

*Appointment of Trustees*

**Shrewsbury.** P. D. Carless and R. M. Jones, radio, television and electrical retailers, formerly carrying on business at 22 Dogpole. Mr P. J. Snow, 17 Albion St, Hanley, Stoke-on-Trent, appointed trustee as from 11 Aug.

**Newcastle upon Tyne.** W. I. Hunter, electrical appliance dealer, formerly carrying on business as Hunters Electrics at 81-82 Redheugh Rd, Gateshead. Mr. E. Taylor, 30-32 Grey St, Newcastle upon Tyne 1, appointed trustee as from 16 Aug.

# NEW COMPANIES

*Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.*

**F. L. Brooks and Co. Ltd.** Manufacturers of and dealers in artificial lighting apparatus, etc. Nom. cap.: £2,000. Dirs.: William P. Harding and Gladys L. Harding, "Breckland," Ashmans Rd, Beccles, Suffolk.

**L. N. Collett Ltd.,** Lombard Hse, Gt. Charles St, Birmingham 3. Manufacturers of and dealers in electrical goods, etc. Nom. cap.: £5,000. Dirs.: Lucy N. Collett and Charles A. Collett.

**Desilux Ltd.,** 143 Whitfield St, W.1. Manufacturers of electrical equipment, compressed air warning devices and all types of warning signals, etc. Nom. cap.: £20,000. Dirs.: Gerda C. Hansen and Jorgen A. C. Hansen.

**Direct Electrical Contractors Ltd.,** 500 Staines Rd, Twickenham, Middx. Nom. cap.: £100. Dirs.: Walford C. Howell and Margaret A. Howell.

**District Electrical Co. Ltd.,** 102 Seel St, Liverpool. Nom. cap.: £15,000. Dirs.: Arnold R. Arrowsmith, Eric M. Basterra, Gordon R. Gibbons, Dennis E. Miller and David R. Roberts.

**Foy's (Electrical) Ltd.,** 121 High St, Sheerness, Kent. To take over the business of an electrical, wireless and television dealer carried on as "Foy's Electrical and Radio" by Olive E. Foy at Sheerness, etc. Nom. cap.: £1,000. Dirs.: Olive E. Foy, Wm. E. McLean and Herbert W. Quested.

**Morphy-Brien Developments Ltd.,** 86 Cannon St, E.C.4. To acquire letters patent, brevets d'invention, relating to engineering, chemicals and electronics, etc. Nom. cap.: £1,000. Dirs.: Alexander L. Morphy and William E. P. O'Brien.

**S. Page and Co. Ltd.,** 84 Connaught Rd, Sutton, Surrey. To take over business of electrical contractors and ancillary trades carried on at Sutton, Surrey, by S. C. A. Page, etc. Nom. cap.: £500. Dirs.: Stanley C. A. Page and Mrs. Margaret A. Page.

**Palmers Electrical Ltd.,** 28 Douro St, Norwich. Electrical engineers, etc. Nom. cap.: £1,000. Dirs.: Kenneth H. W. Palmer, Edwin A. Tooke and Margaret Amies.

**Specialised Electrical Services Ltd.,** Somerset Hse, Blagrave St, Reading. Nom. cap.: £100. Dirs.: Robert J. B. Wilson and Mrs. Elizabeth A. Wilson.

**Stewart and Scott (Electrical Contractors) Ltd.,** "Joleen," Gore Rd, Dartford, Kent. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Stanley H. Lucas and Francis A. Dean.

**Taylor and Pike Ltd.,** 38 Fore St, Hertford. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Nom. cap.: £1,500. Dirs.: Aubrey J. Taylor and Maurice V. H. Pike.

**Venour Electrical Co. Ltd.,** Devonshire Hse, Gt. Charles St, Birmingham 3. To take over the business of electrical engineers carried on at 2 Cranmore Rd, Castle Bromwich, etc. Nom. cap.: £1,000. Dirs.: Sidney S. Venour, Ronald S. Venour, Roy A. Ainsworth and Frederick Smith.

# The key is under the mat, Mrs. Brown

At least it was when she left this morning—and she takes it for granted it's still there. How about the other things people take for granted? The lock the key fits into, the door check, the knocker, the finger plate, even the hinges. More than likely they're pressure die castings—an inseparable part of modern life.

Wolverhampton pressure die castings offer manufacturers high quality components at remarkably low cost in a variety of pleasing finishes. And the massive scale of production *they* can achieve helps everyone to enjoy a higher standard of living. Wolverhampton pressure die castings in zinc and aluminium point to progress in a big way. Your enquiries would be welcomed.

**THE WOLVERHAMPTON DIE CASTING COMPANY LTD**

GRAISELEY HILL, WOLVERHAMPTON TELEPHONE: WOLVERHAMPTON 23831

THE SIGN OF QUALITY
EMB
ESTABLISHED 1908

# Control Gear

Berkeley Nuclear Power Station designed and constructed for the Central Electricity Generating Board by AEI-John Thompson Nuclear Energy Co., Ltd.

Acknowledgements also to crane makers: — J. H. Carruthers & Co., Ltd., Glasgow.

## at Berkeley

*For reliability under exacting conditions, specify E.M.B. control gear*

Illustration shows one of the two 100 ton charge face cranes supplied by carruthers of Glasgow for Berkeley. E.M.B. supplied the control desks and the associated contactor control gear with MICROsen to give creep speed control to the A.C. slip ring motors.

## E.M.B. Co. Ltd.

WEST BROMWICH
Phone: WESt Bromwich 1171
ENGLAND

# CLASSIFIED ADVERTISEMENTS

## TENDERS INVITED

### ELECTRICITY CORPORATION OF NIGERIA

**132 kV Single Circuit Transmission Line**

**Aba/Umuahia/Oji**

TENDERS are invited for the supply and erection of approximately 90 miles of single circuit 132 kV Transmission Line between Aba/Oji River Power Station.

The Contract includes for the manufacture, supply, testing, insurance, packing for export, shipment to a tropical climate, complete delivery to site, erection, testing, commissioning and maintenance for 12 calendar months of the whole of the Contract Works.

A short precis of the extent of the works for which complete and comprehensive offers are invited may be had on application to the Resident Engineer, The Electricity Corporation of Nigeria, Adelphi, John Adam St, London W.C.2, or the Secretary, Electricity Corporation of Nigeria, 13 Broad St, Private Mailbag 2030, Lagos.

Tender Documents, which will be available from 31 Aug., 1961, may be obtained from the same addresses on receipt of payment by cheque of £12 in favour of the Electricity Corporation of Nigeria. This payment will not be refundable.

Completed Tender must be under sealed cover endorsed "Tender for Aba-Umuahia-Oji 132 kV Transmission Line" and must be received at the Office of the Resident Engineer, The Electricity Corporation of Nigeria, Adelphi, John Adam St, London W.C.2, by 12 noon on 30 Oct., 1961.

The Electricity Corporation do not bind themselves to accept the lowest or any Tender nor will they be responsible for any costs incurred by Tenderers in making their Tender.

G. W. E. NICOL,
Secretary to the Corporation.
(B 705)

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### CITY OF BATH

**Re-wiring 88 pre-war Flats at Kingsmead**

TENDERS are invited for re-wiring the whole of the lighting installation and wiring new socket outlets in all flats.

The specification and particulars of the electrical installation may be obtained from the City and Waterworks Engineer, Guildhall, Bath, and the Standing Orders may be examined at his Office upon the payment of £2 2s, which will be refunded on receipt of a bona fide tender.

Tenders must be sealed and delivered in the envelope provided not later than NOON on 6 Sept., 1961, to the Town Clerk, Guildhall, Bath.

The Council does not bind itself to accept the lowest or any tender.

Tenders will only be considered from Electrical Contractors who are entered on the National Register of Electrical Installation Contractors and/or members of the Electrical Contractors Association (Inc.) as duly qualified and to carry on business within the rules and conditions of the National Register and/or Electrical Contractors Association (Inc.).

JARED E. DIXON,
Town Clerk.

Guildhall,
Bath. (B 704)

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### THURROCK URBAN DISTRICT COUNCIL

**Tenders for Electrical Installations**

APPLICATIONS are invited from Electrical Installation Contractors who wish their names to be included on a list from which firms may be selected to submit tenders for this type of work.

Applicants must be members of either:—

(a) The National Inspection Council of Electrical Installation Contractors; or

(b) The Electrical Contractors Association.

Contractors wishing to be considered should forward their names to Mr. C. S. H. Hawkes, M.I.C.E., M.I.MUN.E., M.R.S.H., Engineer and Surveyor, Council Offices, Palmer's Ave, Grays, not later than first post, Monday, 11 Sept., 1961.

The application should be accompanied by a declaration showing to which of the above bodies they belong and a list of Authorities for whom they have executed work.

A. E. POOLE,
Clerk of the Council.

Council Offices,
Whitehall La,
Grays. (B 671)

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### NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

TENDERS are invited for the construction of a 132 kV single circuit steel tower line, approximately three miles route length in the County of Argyll. Tender Documents may be obtained on application with the deposit of £2 2s (returnable) to the Engineers, Messrs. Merz and McLellan, 72A George St, Edinburgh 2. The Board do not bind themselves to accept the lowest or any Tender. (B 746)

## APPOINTMENTS VACANT

### CENTRAL ELECTRICITY GENERATING BOARD

**North Eastern Region**

ASSISTANT ELECTRICAL ENGINEER

APPLICATIONS are invited for the appointment of Assistant Electrical Engineer in the Regional Research and Development Department.

Applicants, preferably under 26, should possess an honours degree or equivalent. The work is varied and embraces all aspects of generation and transmission of electrical energy. Current work is concerned with novel methods of de-icing conductors, preventing insulator pollution and economic system loading. Candidates will be expected to have a sound theoretical knowledge. Previous research experience would be an advantage.

Good promotion prospects exist within the Board's Research and Development Department. Salary on a scale within the range £765/£1,090 or £965/£1,410 per annum depending on qualifications and experience.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 30 Sept., 1961. (B 733)

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### CENTRAL ELECTRICITY GENERATING BOARD

**North Eastern Region**

APPLICATIONS are invited from suitably qualified engineers for the following appointments in the Technical Branch of the Regional Electrical Department.

(1) ONE THIRD ASSISTANT ENGINEER

(PROTECTION)

Grade 8, Class K (£1,145/£1,410 per annum) based on Leeds (Test Laboratory) to undertake testing of complete protective equipments and components and investigate problems arising on equipment in service.

(2) THREE FOURTH ASSISTANT ENGINEERS

(PROTECTION)

Grade 11, Class K (£900/£1,165 per annum), based on Leeds (Test Laboratory) to assist with the work described under Vacancy (1).

(3) ONE THIRD ASSISTANT ENGINEER

(PROTECTION)

Grade 8, Class K (£1,145/£1,410 per annum) based on Leeds (Design Section) to undertake the checking of schematic diagrams, wiring diagrams and specifications for protective and control gear and associated apparatus. Site commissioning experience would be an advantage.

(4) THREE FOURTH ASSISTANT ENGINEERS

(PROTECTION)

Grade 10 or 11, Class K (£980/£1,245 or £900/£1,165 per annum) based on Leeds (Design Section) to assist with the work described under Vacancy (3).

(5) FIVE FOURTH ASSISTANT ENGINEERS

(PROTECTION)

Grade 11, Class K (£900/£1,165 per annum) based on North Tees (2), Leeds, Wakefield and Keadby to assist with testing and commissioning of generators, transformers, switchgear, lines and cables and with the testing, commissioning and maintenance of protective gear and control and indicating equipment for switchgear and transformers.

In all cases experience in a switchgear manufacturer's works would be an advantage.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 22 Sept., 1961. (B 731)

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### SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER

WOKING DISTRICT

SALARY: £1,115/£1,245 per annum under N.J.B. Class G, Grade 7.

ASSISTANT DISTRICT ENGNEER

WOKING DISTRICT

Salary: £965/£1,090 per annum under N.J.B. Class G, Grade 9.

Posts are superannuable. Both appointments occur in a rapidly expanding urban and rural district. Applicants of good general education should have had technical training to Higher National Certificate standard, with practical experience of general distribution work and be capable of assisting on planning, construction and maintenance work.

Consideration will be given to a private car allowance and in appropriate circumstances to assistance with housing.

Applications, quoting ref. ET and stating which post applied for, on forms from the District Manager, Seeboard, 4 Chobham Rd, Woking, to be returned by 13 Sept., 1961.

GEORGE WRAY,
Secretary.
(B 743)

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Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 46s. per inch, and all other classified advertisements at 3s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

## CENTRAL ELECTRICITY GENERATING BOARD

### Midlands Region

APPOINTMENT OF THIRD ASSISTANT ENGINEER (SYSTEM DESIGN) REGIONAL ELECTRICAL DEPARTMENT

Vacancy No. MR.198

APPLICATIONS are invited for the above appointment which in the first instance will be located in Nottingham with eventual transfer to Birmingham.

Applicants should preferably hold a degree or have attained the Higher National Certificate standard or equivalent in Electrical Engineering. Preference will be given to candidates who have had experience of switchgear and protective gear systems.

Duties will include the preparation of transmission reinforcement schemes, calculation of fault levels, preparation of load flow diagrams and operation of d.c. and a.c. network analysers.

Salary will be in accordance with experience and qualifications within the range L7, £1,260/£1,610, of the National Joint Board Agreement.

Applications in writing quoting the above Vacancy No. to the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, 53 Wake Green Rd, Moseley, Birmingham 13, to arrive not later than 11 Sept., 1961. (B 721)

## AIR MINISTRY

REQUIRE Main Grade and Basic Grade MECHANICAL AND ELECTRICAL ENGINEERS

for design, construction and maintenance of installations on (a) airfields, radar stations, missile bases, workshops and maintenance units for the R.A.F. at home and overseas; and (b) certain Civil Airports.

SALARY according to age, quals. and exp., ranges for Main Grade Engineers from £1,456/£1,950 (max.) and for Basic Grade from £936 (at 25) to £1,430 (max.), with an increase for London and slight decrease in country districts. In addition, basic grade salary is increased by £95 p.a. (within the maximum of the scale) after two years' approved service, subject to being corporate member of Institution of Mechanical or Electrical Engineers. Appointments long term with good prospects of pension and advancement to numerous posts in higher grades, viz.:

Main Grade Mechanical and Electrical Engineers, £1,456/£1,950—125 posts.

Senior Mechanical and Electrical Engineers, £2,080/£2,392—34 posts.

Superintending Mechanical and Electrical Engineers, £2,650 upwards—9 posts.

Vacancies occurring in these higher grades are, as a rule, filled by promotion of existing staff.

Good opportunities for acquiring experience overseas, where special allowances ranging at present up to £1,800 p.a. according to location and marital status, are payable in addition to a higher salary. Five-day week with four weeks two days' paid leave p.a. initially.

QUALS.: (a) Graduate (for Basic Grade) or corporate (for Main Grade) membership of I.E.E. or I.Mech.E. (with appreciable electrical engineering experience) with at least three years' apprenticeship; or

(b) University degree (honours for Main Grade) or equivalent diploma in electrical and/or mechanical engineering with at least two years' apprenticeship.

In addition, all candidates should have been employed for minimum of two years with well established engineering concern and gained wide experience in both electrical and mechanical engineering practice.

Applicants must be natural born British subjects and, for basic grade posts, between ages 25 and 35. Forms from Ministry of Labour, Technical and Scientific Register (K), 26 King St, London S.W.1, quoting D.128/1A. Selection will be by interview in London and certain expenses will be reimbursed. (B 428)

## SOUTH EASTERN REGIONAL HOSPITAL BOARD, SCOTLAND

### Regional Engineer's Department

APPLICATIONS are invited for the following posts of

PRINCIPAL ASSISTANT ENGINEERS

The salary scale is £1,665/£2,035 per annum. The appointments are superannuable and subject to Whitley Council conditions of service.

Applicants should have a wide experience in the design, and the preparation of technical specifications, for all types of engineering installations in modern hospitals or large public buildings.

MECHANICAL. Major Central Steam and H.W. Boiler Plants, Firing equipment and combustion control systems, centralised distribution services; Heating, Ventilation, Air Conditioning and D.H.W. service systems; auto-thermostatic control systems; Laundry and Kitchen plant layout and services.

ELECTRICAL. All types of electrical installation work, including distribution; power services; illumination; auto-control systems (Heating, Ventilating and Air Conditioning); Bed and Passenger Lifts; call systems and tele-communication systems.

Applicants should be corporate members of appropriate Engineering Institutions and should have the necessary experience to be capable of leading and supervising a team of technical design staff.

Applications stating age, qualifications, experience and posts previously held, along with the names and addresses of three referees, should be forwarded to the Secretary, 11 Drumshough Gdns, Edinburgh 3. Closing date for applications, 30 Sept., 1961. (B 699)

## CENTRAL ELECTRICITY GENERATING BOARD

### West Midlands Division

SHIFT CHARGE ENGINEER

REQUIRED at Stourport "A" and "B" Power Stations. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K6, £1,440/£1,610 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear preferably in a large modern power station are required and the possession of appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy No. 224/61 MD on form AE6, available from the Station Superintendent, Stourport Power Station, Severn Side, Stourport-on-Severn, Worcs, by 8 Sept., 1961.

W. F. CUSWORTH,
Assistant Regional Director.
(B 724)

## NORTH BORNEO ELECTRICITY BOARD

ELECTRICAL ENGINEER

APPLICATIONS are invited for the above post on contract for one tour of three years. Salary according to qualifications and experience in scale (including Inducement Allowance) rising to £2,534 a year. Gratuity at rate of 15% of basic salary drawn for each completed year of service. Outfit allowance of £60. Quarters at moderate rental. Free passages. Liberal leave on full salary.

Candidates, under 45 years of age and preferably Corporate Members of the I.E.E., must be able to supervise staff engaged in installation and maintenance of diesel generating plant, and capable of designing overhead and underground distribution schemes up to 33 kV. They should also be able to organise general office staff and departments dealing with tariffs and stores.

Apply to CROWN AGENTS, 4 Millbank, London S.W.1, for application form and further particulars, stating age, name, brief detatils of qualifications and experience and quoting Ref. M2A/51387/EE. (B 717)

## THE NORTH WESTERN ELECTRICITY BOARD

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER (INSTALLATION AND SERVICING)

NORTH-WEST DISTRICT, ECCLES

DUTIES will include estimating for and supervising electrical installation work in all classes of property, supervision of servicing and domestic appliance repairs. Preference given to applicants with technical qualifications.

Salary Scale: £1,190/£1,325 p.a. Grade H.7. N.J.B. conditions.

Applications on forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester 2, P.O. Box 493, and returned to him by 11 Sept., 1961.

THIRD ASSISTANT DISTRICT ENGINEER

CHORLEY DISTRICT

Duties will include the operation, maintenance and construction of underground and overhead mains and substations, and general distribution work, including standby duties.

Preference will be given to applicants who hold the H.N.C. in Electrical Engineering.

Salary Scale: £1,040/£1,165 p.a. Grade H.9. N.J.B. conditions.

Applications on forms to be obtained from the Manager, No. 4 Sub-Area, The North Western Electricity Board, 40-41 Lune St, Preston, and returned to him by 11 Sept., 1961. (B 726)

## SOUTH OF SCOTLAND ELECTRICITY BOARD

### Edinburgh and Borders Area

THIRD ASSISTANT ENGINEER (PLANNING AND DEVELOPMENT)

AREA HEADQUARTERS, DEWAR PLACE, EDINBURGH

SALARY: N.J.B. Schedule A, Class L, Grade 10, Salary Scale No. 10, £1,190/£1,325 p.a.

Applications, on the standard form, obtainable from the undersigned or any other Area Manager, should be submitted not later than 15 Sept., 1961.

Applicants for this superannuable appointment should have a sound engineering training and experience in the design and layout of densely loaded distribution networks in city areas and rural systems at pressures up to and including 33 kV; the application of modern protective equipment and of the calculation and preparation of load flow diagrams and fault levels. Applicants must also possess as a minimum qualification, a Higher National Certificate in Electrical Engineering or its equivalent.

Conditions of service will be in accordance with the National Joint Board Agreement for the Electricity Supply Industry. The successful candidate will require to reside within a reasonable distance of Area Headquarters.

C. H. A. COLLYNS,
Manager,

52 Melville St,
Edinburgh 3. (B 698)

## CENTRAL ELECTRICITY GENERATING BOARD

### South Thames Division

BRIGHTON "A" POWER STATION

GENERAL ASSISTANT ENGINEER (RELIEF)

Vacancy No. 230/61

THE successful applicant will be given Control Room training, will be required to assist Charge Engineers in operational duties and to act as an observer in testing of plant. General engineering experience and/or an engineering apprenticeship preferred.

Salary: N.J.B. Class H, Grade 14, £715/£805 per annum, plus £90 per annum shift allowance when applicable.

Applications giving age, details of qualifications, experience, etc., should be sent to the Station Superintendent, Brighton "B" Power Station, Portslade-by-Sea, Sussex, to arrive by 13 Sept., 1961. (B 729)

## CENTRAL ELECTRICITY GENERATING BOARD

### South Eastern Region

### North Thames Division

APPLICATIONS are invited for the following appointment in the System Operation Department, Thames North Grid Control Centre, Redbourn, near St. Albans, Herts.

THIRD ASSISTANT ENGINEER

Salary: N.J.B. Class K, Grade 8, Scale 11, £1,105/£1,410 per annum plus 10% Shift Allowance.

S.V. No. 1516.

Applicants who applied as a result of the recent advertisement need not re-apply as they will automatically be reconsidered.

The commencing salary will be within the above range at a point commensurate with qualifications and experience. The minimum technical qualification required is the Higher National Certificate in Electrical Engineering.

Some generating station and/or transmission/technical experience is essential. The successful applicant will be required to undertake shift duties in the Grid Control Room.

Forms of Application (AE6/ACT) may be obtained from the Board's Headquarters, or from any Divisional Offices of the Board, and should be addressed to the Personnel Officer, Central Electricity Generating Board, North Thames Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 9 Sept., 1961, quoting reference S.V. No. 1516. (B 695)

## SOUTH OF SCOTLAND ELECTRICITY BOARD

### Glasgow Area

APPLICATIONS are invited from suitably qualified engineers for the following superannuable appointment.

THIRD ASSISTANT ENGINEER

(PLANNING AND DEVELOPMENT)

Candidates for this post should preferably be in possession of the H.N.C. in Electrical Engineering or equivalent qualification and should have a sound engineering training with subsequent experience in the design and layout of large distribution systems at pressures up to and including 33 kV in a densely loaded industrial and residential area. A knowledge of the application of modern protective equipment and of the calculation of fault levels and preparation of load flow diagrams is desirable.

Salary: £1,190/£1,325 per annum in accordance with Class L, Grade 10 (Scale 10) of the N.J.B. Salary Scale.

The successful candidate for this post shall be required to reside within reasonable travelling distance of Area Headquarters.

Applications, quoting reference number GE/56/61, should be submitted on the standard application form, which is obtainable from the Area Secretary, P.O. Box 6, 75 Waterloo St, Glasgow C.2, and returned not later than Friday, 15 Sept., 1961. (B 694)

## CENTRAL ELECTRICITY GENERATING BOARD

### South Thames Division

ELECTRICAL ENGINEERS DEPARTMENT

CROYDON DISTRICT

FOURTH ASSISTANT ENGINEER

Vacancy No. 203A/61.

REQUIRED for transmission, operation and maintenance work in the District. Preference will be given to applicants with some experience of transmission and theoretical qualifications leading ultimately to Associated Membership of the I.E.E.

Salary: N.J.B. Grade 11, £940/£1,215 per annum, including London allowance, with prospects of promotion subject to satisfactory service.

Applications giving age, details of experience, qualifications, etc., should be sent to the Personnel Officer, Central Electricity Hse, Lower Ham Rd, Kingston upon Thames, Surrey, to arrive by 13 Sept. (B 728)

## SIERRA LEONE GOVERNMENT

### Electricity Department

ELECTRICAL ENGINEER

REQUIRED on contract for one tour of 15-18 months. Salary according to age and experience in scale (including inducement pay) rising to £2,025 a year. Gratuity at rate of 15% of total salary drawn. Outfit allowance £60. Free passages. Liberal leave on full salary.

Candidates under 50 years must be Graduate or Corporate Members of the Institution of Electrical Engineers and must have had experience in the design and erection of overhead power lines, commissioning of electrical plant of 2,000 kW.

Apply to CROWN AGENTS, 4 Millbank, London S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience and quoting reference M2A/51393/EE. (B 700)

## MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

### Central Gloucestershire Area:

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER (DEAN FOREST)

Applicants should have a sound commercial background, including a thorough knowledge of Industrial, Commercial and Rural Development work. Technical qualifications desirable. Salary: £890/£1,015 per annum (N.J.B. Grade E.8). Apply, by letter, within 14 days, stating age, experience, present position and salary, to Mr. S. Raybould, Area Manager, Midlands Electricity Board, Eastern Ave, Gloucester.

### North Staffordshire Area:

GENERAL ASSISTANT DISTRICT ENGINEER (NEWCASTLE)

Duties include assistance on the planning, construction and maintenance of H.V. and L.V. overhead and underground mains. Technical qualifications desirable. Salary: £715/£805 per annum (N.J.B. Grade F.12). Apply, by letter, within 10 days, stating age, experience, present position and salary, to Mr. C. C. Pimble, Area Manager, Midlands Electricity Board, 234 Victoria Rd, Fenton, Stoke-on-Trent.

F. W. CATER,
Secretary.
(B 714)

## SOUTH OF SCOTLAND ELECTRICITY BOARD

### Lanarkshire Area

APPOINTMENT OF SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER LANARK DISTRICT

APPLICATIONS are invited for the above superannuable appointment.

Applicants should have had a sound engineering and technical training and subsequent experience in the development of commercial, industrial and domestic loads and of "Off Peak" supplies with a good knowledge of heating installation, including floor-warming. They will also be required to assist in the general work of the Commercial Department.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Schedule A, the present classification and grading being E.7. Salary: £965/£1,090 per annum.

Application forms which can be obtained from the Manager, Montrose Cres, Hamilton, should be returned to this office within 14 days from the date of this advertisement. (B 718)

## CENTRAL ELECTRICITY GENERATING BOARD

### West Midlands Division

POWER STATION SUPERINTENDENT

REQUIRED at Stourport "A" and "B" Power Stations. Salary in accordance with N.J.M. Scale C6, £2,380/£2,595 per annum.

Candidates should have wide experience in the operation and maintenance problems of a large modern generating station, and should possess sound administrative ability. They should preferably hold a university degree in engineering or be Corporate Members of the Institution of Electrical and/or Mechanical Engineers.

Apply, quoting Vacancy No. 226/61 MD on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 8 Sept., 1961.

W. F. CUSWORTH,
Assistant Regional Director.
(B 722)

## MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SERVICE CENTRE SUPERVISOR

WALLASEY

APPLICATIONS are invited for the above appointment in the North Wirral District from candidates experienced in the management of electrical appliance sales, staff direction and control and good customer relationships.

Salary within the range of £1,020/£1,140 per annum (Grade 5, N.J.C.). Excellent pension, holiday and sick pay schemes, subject to medical examination.

Forms of application obtainable from the Manager, No. 3 Sub-Area, Electricity Hse, 25 Newgate St, Chester, should be returned not later than 15 Sept., 1961. (B 707)

## CITY OF MANCHESTER—HOUSING COMMITTEE

APPLICATIONS invited for the appointment of

SENIOR ASSISTANT

(ELECTRICAL SERVICES)

APT. Grade V, £1,310/£1,480 per annum (at present under review).

Candidates must be experienced in preparation of schemes and estimates for gas and electrical installations in houses and multi-storey flats, including specifications, supervision of work in progress, interim valuations and final accounts, and be capable of undertaking necessary design work for under-floor electric heating and warm air gas heating installations.

Preference will be given to those holding H.N.C. for electrical engineering, or those eligible for election to or who are members of the Institute of Electrical Engineers.

Applications giving full details to be received by the Director of Housing, Town Hall, Manchester 2, by 15 Sept., 1961. (B 715)

## CENTRAL ELECTRICITY GENERATING BOARD

### West Midlands Division

ASSISTANT SHIFT CHARGE ENGINEER

REQUIRED at Stourport "A" and "B" Power Stations. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade K8, £1,275/£1,410 per annum, plus 10% for shift duties.

Applicants should have received a sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear, and a knowledge of P.F. firing is desirable. Appropriate technical qualifications would be an advantage.

Apply, quoting Vacancy No. 225/61 MD on form AE6, available from the Station Superintendent, Stourport Power Station, Severn Side, Stourport-on-Severn, Worcs, by 8 Sept., 1961.

W. F. CUSWORTH,
Assistant Regional Director.
(B 723)

## THE SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following posts:

**Monmouthshire and Mid-Wales Area**

GENERAL ASSISTANT ENGINEER

(DRAUGHTSMAN)

MID-WALES AND NORTH MON. DISTRICT

(TO BE BASED AT BRECON)

Salary: N.J.B. Class E, Grade 10, Scale 4, £765/£870 per annum.

Applications stating age, present position, present salary, qualifications and experience should be addressed to W. E. Richardson, M.I.E.E., Manager, Monmouthshire and Mid-Wales Area, Llywelyn Rd, Cwmbran, Mon, to arrive not later than 15 Sept., 1961.

Please quote reference 102/61/ET endorsing envelope "General Assistant Engineer (Draughtsman)."

**Cardiff and East Central Area**

GENERAL ASSISTANT ENGINEER

PONTYPRIDD DISTRICT

Salary: N.J.B. Class F, Grade 11, Scale 4, £765/£870 per annum.

The duties of this post will be of a general nature and it is desirable that applicants should possess a Higher National Certificate in Electrical Engineering.

Applications stating age, present position, present salary, qualifications and experience should be addressed to C. L. Townsend, ASSOCIATE I.E.E., Manager, Cardiff and East Central Area, Colchester Ave, Cardiff, to arrive not later than 15 Sept., 1961.

Please quote reference 105/61/ET endorsing envelope "General Assistant Engineer."

R. G. WILLIAMS,
Secretary.
(B 744)

## SOUTHERN ELECTRICITY BOARD

INSTALLATION ASSISTANT

(Z.1334)

SWINDON District of No. 2 (Newbury) Sub-Area. Salary, N.J.B. Class G, Grade 11 (£825/£940 per annum). N.J.B. conditions of service.

Applicants should have had experience in the preparation of specifications and estimates for all types of electrical wiring installations. They should be competent to supervise electricians and organise the allocation of work.

DEMONSTRATOR

(Z.1395)

Oxford District of No. 2 (Newbury) Sub-Area. Salary, N.J.C. Grade 1 (£600/£700 per annum). N.J.C. conditions of service.

Applicants should be qualified to advise generally on the utilisation of electric domestic appliances, to give public demonstrations of apparatus and to assist in showroom duties. The possession of an E.A.W. Certificate or equivalent Domestic Science qualifications would be an advantage.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications for both appointments on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting the appropriate "Z" number, not later than 11 Sept., 1961.

FOREMAN (CONSTRUCTION)

Sub-Area Engineers' Department of No. 1 (Southall) Sub-Area, located at Waterloo Rd, Uxbridge. Salary, N.J.I.C. Schedule E, Grade 2, £795 per annum plus £35 London Allowance. N.J.I.C. conditions of service.

Applicants must have had experience in the laying and jointing of cables up to and including 33 kV together with the necessary auxiliaries by direct labour and contract. Experience in the installation of indoor and outdoor substation plant would be an advantage.

Applications, in writing, giving details of ags, experience, etc., should be forwarded to the Sub-Area Secretary, 2 Windmill La, Southall, Middx, quoting Z.1373, not later than 11 Sept., 1961. (B 735)

## CENTRAL ELECTRICITY GENERATING BOARD

**South Thames Division**

RICHBOROUGH POWER STATION

APPLICATIONS are invited for the following appointments at Richborough Power Station, now being constructed on the Kent coast between Ramsgate and Sandwich. The ultimate capacity of the Station is three 120 MW reheat units.

Applicants should have had managerial and operational or maintenance experience in a large modern station; commissioning experience would be an advantage.

Vacancy No. 226/61.

DEPUTY STATION SUPERINTENDENT

Salary: N.J.B. K2, £1,920/£2,085.

Vacancy No. 231/61.

OPERATION SUPERINTENDENT

Salary: N.J.B. K4, £1,650/£1,830.

Vacancy No. 233/61.

MAINTENANCE ENGINEER (MECHANICAL)

Salary: N.J.B. K5, £1,535/£1,720.

Vacancy No. 234/61.

MAINTENANCE ENGINEER (ELECTRICAL)

Salary: N.J.B. K5, £1,535/£1,720.

Vacancy No. 235/61.

MAINTENANCE ENGINEER (INSTRUMENTS)

Salary: N.J.B. K7, £1,350/£1,500.

Applications stating age, details of experience and qualifications, and quoting Vacancy No., should be sent to the Personnel Officer, Central Electricity Hse, Lower Ham Rd, Kingston upon Thames, Surrey, to arrive by 18 Sept. (B 748)

## COUNTY OF LANARK

CHIEF TECHNICAL ASSISTANT (LIGHTING)

APPLICATIONS are invited for the post of Chief Technical Assistant in the Lighting Section of the County Surveyor's Department at Hamilton on the salary scale £850/£1,150. Applicants should be Corporate Members of the Association of Public Lighting Engineers or the Institution of Electrical Engineers and should have extensive knowledge of the design, erection and maintenance of public lighting installations.

Superannuation scheme in operation and five-day week. Medical examination.

Applications stating age, qualifications and experience, with the names and addresses of three referees, to be lodged with County Clerk, P.O. Box No. 1, Glasgow, by 4 Sept., 1961. (B 706)

## CENTRAL ELECTRICITY GENERATING BOARD

**South Thames Division**

ELECTRICAL ENGINEERS DEPARTMENT

NORTHFLEET DISTRICT

ENGINEER

Vacancy No. 147D/61

REQUIRED to join a District team commissioning major electrical plant in Generating and Transforming Substations in West Kent and maintaining automatic protective and control gear on such plant in that area. Previous experience in similar work is essential. Candidates must possess Higher National Certificate in Electrical Engineering or equivalent qualifications. Ability to make calculations of unbalanced fault conditions, and to write a good report is desirable. The successful candidate will be required to live within approximately 10 miles of the District Headquarters.

The post is designated Third Assistant Engineer (Technical).

Salary range £1,180/£1,460 per annum, including London allowance. The conditions of service are as decided by the National Joint Board, with generous holidays and sick pay scheme and a contributory superannuation scheme.

Applications giving age, details of experience, qualifications, etc., should be sent to the Personnel Officer, Central Electricity Hse, Lower Ham Rd, Kingston upon Thames, Surrey, to arrive by 13 Sept. (B 727)

## THE EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointment.

Applicants should state age, qualifications, experience, etc., and quote the vacancy number.

**Lincolnshire Sub-Area**

FOURTH ASSISTANT DISTRICT

COMMERCIAL ENGINEER

BOSTON DISTRICT

Vacancy Number 107/61.

Salary: N.J.B. Class "F," Grade 11, £765/£870 per annum.

The duties include assisting in the negotiations of the supply of electricity to consumers; advice on tariffs; electrical installations and appliances; street lighting; sales activities and consumer service.

Applicants should have had experience in the work of a District Consumer's Office.

Ability to drive a motor vehicle is essential, and the person appointed will be required to reside in or near Boston.

Applications should be forwarded to the Manager, Lincolnshire Sub-Area, North Hse, Grantham, Lincs, by 15 Sept., 1961. (B 747)

## MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

**No. 1 Sub-Area**

THIRD ASSISTANT COMMERCIAL ENGINEER

REQUIRED at No. 1 Sub-Area Headquarters, Liverpool. Salary is within the range £1,275/£1,410 per annum (N.J.B. M.10).

Applicants should have experience in the commercial and domestic application of electricity and be capable of advising on and estimating for electrical installation work in all classes of commercial premises. They should also be capable of preparing lighting, heating and water heating schemes. Applicants should have suitable technical qualifications.

Appointment subject to medical examination. Pension scheme.

Special application forms are obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool 3, and should be returned not later than 15 Sept., 1961. (B 708)

## YORKSHIRE ELECTRICITY BOARD

**No. 4 (Leeds) Sub-Area**

THIRD ASSISTANT ENGINEER

(DISTRIBUTION DESIGN)

APPLICANTS should have had experience in the design, construction and operation of H.V. and L.V. systems associated with a large industrial urban and rural network.

Salary: N.J.B. Class L, Grade 10 (Scale 10), £1,190/£1,325 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, near Leeds, not later than 15 Sept., 1961.

**No. 6 (Hull) Sub-Area**

GENERAL ASSISTANT ENGINEER

(SURVEYOR)

Applicants should have had sound practical experience in the survey of routes for H.V. and L.V. overhead lines and have experience in the preparation of profile drawings and pole schedules in accordance with B.S. 1320 or other overhead line specifications.

Salary: N.J.B. Class L, Grade 16 (Scale 4), £765/£870 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Kingston upon Hull, not later than 15 Sept., 1961. (B 734)

## CENTRAL ELECTRICITY GENERATING BOARD

### Midlands Region

### East Midlands Division

SECOND ASSISTANT STATION CHEMIST

CASTLE DONINGTON POWER STATION

Vacancy No. 199/61.

APPLICATIONS are invited for the position of Second Assistant Station Chemist at Castle Donington Power Station, near Derby.

Applicants should possess the Higher National Certificate in Chemistry and be experienced in the analysis and testing of fuels, water and oil, and in the interpretation of the results as applied to high pressure power station plant.

Salary will be in accordance with Class L, Grade 11 (£1,115/£1,245 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 8 Sept., 1961.

STATION SHIFT CONTROL ENGINEER

LINCOLN POWER STATION

Vacancy No. 200/61.

Applications are invited for the position of Station Shift Control Engineer at Lincoln Power Station, Spa Rd, Lincoln.

Applicants should have had a sound training and practical experience in a modern power station. The possession of a Higher National Certificate in Electrical Engineering, or its equivalent, would be advantageous.

Salary will be in accordance with Class F, Grade 10 (£825/£940 per annum) plus shift enhancement.

Closing date for receipt of applications: 8 Sept., 1961.

ASSISTANT ENGINEER (CONTROL ROOM)

LEICESTER POWER STATION

Vacancy No. 205/61.

Applications are invited for the position of Assistant Engineer (Control Room) at Leicester Power Station, Rawdykes Rd, Leicester.

Candidates for this post should be suitably qualified and have had experience in the control room.

Salary will be in accordance with Class G, Grade 13 (£715/£805 per annum) of the National Joint Board Agreement, plus £90 per annum allowance whilst engaged on shift duties.

Closing date for receipt of applications: 15 Sept., 1961.

These appointments are pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent concerned and should be returned to him by the date stated.

O. S. WOODS,
Assistant Regional Director.
(B 738)

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## CORPORATION OF GLASGOW

### Architectural and Planning Department

ASSISTANT ENGINEER (ELECTRICAL)

APPLICATIONS for the above superannuable appointment are invited from graduates and associate members of the Institution of Electrical Engineers. Salary scale: £850/£1,560, with placing according to qualifications and experience. There is a point within the scale at which increments may be accelerated.

A five-day week is in operation.

Advance of up to 100% of valuation will be made available where needed for the purchase of suitable house, in or near Glasgow, to successful applicant.

Form of application may be obtained from the Principal Administrative Officer, Architectural and Planning Department, 20 Trongate, Glasgow C.1. (B 737)

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## Eastern Electricity

### Area Board Headquarters

PRINCIPAL ASSISTANT

OFFICE MECHANISATION

185/61.N.

APPLICATIONS are invited for the appointment of a Principal Assistant (Office Mechanisation), Chief Accountant's Department, Board Headquarters, to assist in the review of mechanised accounting systems throughout the Board's area and, in particular, to undertake systems analysis and programming for electronic data processing equipment.

Applicants' knowledge or experience should provide evidence of aptitude for this type of work; training will be provided for specialised equipment. An accountancy qualification or University Degree would be an advantage.

The conditions of service will be in accordance with the National Joint Council Agreement and the salary will be Grade 7 (£1,250/£1,355).

Applications, stating age, education, qualifications, experience and present position, should be sent to reach the Chief Accountant, Eastern Electricity Board, Wherstead, Ipswich, Suffolk, by 29 Sept., 1961.

### Fens Sub-Area

FITTER (ELECTRICAL)

PROTECTION SECTION

186/61.R.

Applications are invited for the position of Fitter (Electrical) to work with the Sub-Area Protection Section based at Thompsons La, Cambridge.

Duties will include work in connection with the testing and commissioning of substations and protective gear over the whole Sub-Area.

N.J.I.C. rates and conditions. Present rate 5s 6½d for 42-hour five-day week.

SALES REPRESENTATIVE

PETERBOROUGH

187/61.R.

Candidates should have a good education, possess a progressive sales outlook and a comprehensive knowledge of electrical appliances and installation work. Possession of the E.D.A. Salesmanship Certificate would be an advantage.

Salary: N.J.C. Grade 1 (£600/£700).

Apply by letter to the Secretarial Officer, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge, by 15 Sept., 1961.

### Northmet Sub-Area

THIRD ASSISTANT ENGINEER

ST. ALBANS DISTRICT

(Ref. 1052) 188/61.R.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary: N.J.B. Class H, Grade 9, £1,040/£1,165.

Apply by letter to F. J. Drake, ASSOCIATE I.E.E., Manager, Eastern Electricity Board, 107 St. Peter's St, St. Albans, Herts, by 11 Sept., 1961.

### Suffolk Sub-Area

SECOND ASSISTANT ENGINEER

(OPERATION AND MAINTENANCE)

SUB-AREA ENGINEER'S DEPARTMENT

189/61.R.

Candidates should be Corporate Members of the Institution of Electrical Engineers, or possess equivalent qualifications, and be experienced in the supervision of engineering staff engaged on:

(a) Maintenance and constructional work on rural and urban distribution systems and major substations up to and including 33 kV.

continued in next column

continued from previous column

(b) Centralised system control of operational switching and loading on H.V. distribution networks up to and including 33 kV.

The successful candidate will be expected to reside within close distance of the Sub-Area Control Centre, Ipswich Rd, Badley, near Stowmarket, Suffolk.

Salary: N.J.B. Class K, Grade 7, £1,350/£1,500.

Apply by letter to the Manager, Suffolk Sub-Area, Finborough Hall, Stowmarket, Suffolk, by 15 Sept., 1961. (B 749)

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## SOUTH WESTERN ELECTRICITY BOARD

THIRD ASSISTANT DISTRICT ENGINEER

(COMMERCIAL)

BRISTOL CENTRAL (COMMERCIAL) DISTRICT

SALARY according to Class K, Grade 9. Salary Scale 10, £1,190/£1,325 per annum of the N.J.B. Agreement.

The successful candidate will be responsible for duties in connection with the general commercial activities of the District, with special responsibilities in relation to negotiations with industrial consumers, sales and contracting.

Applicants should have a sound theoretical and practical knowledge of electrical installations and be conversant with I.E.E. and Factory Regulations. They should be capable of estimating for electrical installations in factories, domestic premises, housing estates, etc., and be competent to advise consumers on all classes of installation work, choice and performance of apparatus, and also on tariff matters.

Candidates should possess appropriate technical qualifications at least equivalent to the Higher National Certificate, and the possession of a current driving licence is desirable.

Applications for this post to be made on Standard Form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Commercial Manager, Bristol Central, South Western Electricity Board, Electricity Hse, Colston Ave, Bristol 1. Closing date for completed applications is 16 Sept., 1961. (B 741)

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## THE SOUTH WALES ELECTRICITY BOARD

PRINCIPAL ASSISTANT

SECRETARY'S DEPARTMENT

APPLICATIONS are invited for the position of a Principal Assistant in the Secretary's Department at the Head Office of the Board, St. Mellons, Cardiff.

The duties of the position will be mainly administrative in character, but will require some ability for work of a public relations character. Candidates, who must have general administrative experience, should be able to demonstrate capacity:

(i) to write material for inclusion in handbooks, etc.,

(ii) to prepare announcements for issue to the Press,

(iii) to organise conferences, visits, etc.,

(iv) to act as Secretary to various Committees.

The varied range of duties calls for qualities of energy and adaptability. Possession of a suitable secretarial qualification or a university degree will be an advantage, and a knowledge of the supply industry is desirable.

The duties may be varied according to the qualification of the successful applicant. The salary will be within N.J.C. Grade 7 (£1,250/£1,355) or Grade 8 (£1,380/£1,500) per annum, as appropriate.

Applications stating age, present position, present salary, qualifications and experience, should be addressed to the undersigned to arrive not later than 22 Sept., 1961.

Envelopes should be endorsed "Principal Assistant, Secretary's Department, 106/61/ET."

R. G. WILLIAMS,
Secretary.
(B 745)

**MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD**

**No. 1 Sub-Area**

Staff Vacancy Notice.

FOURTH ASSISTANT ENGINEER

(PLANNING)

REQUIRED at No. 1 Sub-Area Headquarters, Liverpool. Salary will be within range £1,040/£1,165 per annum (N.J.B. Class M, Grade 13).

Applicants should have had sound training in all aspects of the distribution of electricity, and have a knowledge of the technical and economic principles underlying the design of distribution systems, the possession of suitable technical qualifications is desirable.

Appointment subject to medical examination. Pension scheme.

Special application forms, obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Gdn, Liverpool 3, should be returned not later than 15 Sept., 1961. (B 740)

**CENTRAL ELECTRICITY GENERATING BOARD**

**West Midlands Division**

ASSISTANT ENGINEER (RELIEF)

REQUIRED at Warwick Power Station, N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade E.12, £670/£750 per annum.

The engineer will be expected to carry out shift relief duties and when not so employed will be available to undertake duties in the maintenance and operation departments. Shift allowance as laid down in the N.J.B. Agreement will be paid when shift duties are worked.

Applicants should have received a sound technical training and appropriate qualifications will be an advantage.

Apply, quoting Vacancy No. 228/61MD on form AE6, available from the Station Superintendent, Warwick Power Station, Emscote Rd, Warwick, to whom they should be returned, when completed, not later than 11 Sept., 1961. (B 742)

**SOUTH OF SCOTLAND ELECTRICITY BOARD**

APPLICATIONS are invited for a superannuable position as a

THIRD ASSISTANT ENGINEER

(PROTECTIVE GEAR)

in the Technical Section of the Chief Engineer's Department at Board Head Office.

Applicants should possess a Degree or Higher National Certificate in Electrical Engineering and should have had experience in the design and application of protective gear and in fault calculations, both symmetrical and unsymmetrical. Preference will be given to candidates having previous experience at the works of an electrical manufacturer.

Salary: N.J.B. Class K, Grade 7 (£1,235/£1,500) or Grade 8 (£1,145/£1,410).

Applications, quoting reference E26/61, should be submitted on the standard form to the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, not later than 15 Sept., 1961. (B 739)

## JAMES BOOTH ALUMINIUM LIMITED

**have immediate vacancies for:**

**JUNIOR ELECTRICAL ENGINEERS,** having H.N.C. or Grad. I.E.E. as minimum qualifications, with experience either of heavy rolling mill drives or of factory distribution systems, including 11 kV equipment and conversant with schematic diagrams and contractor equipment.

**ELECTRICAL DRAUGHTSMEN,** having O.N.C. as minimum qualification, with experience of installation and distribution drawings and capable of developing schemes from schematic diagrams.

Apply with full details, etc.:

**The Engineering Director,**
**JAMES BOOTH ALUMINIUM LIMITED,**
**Argyle Street,**
**Nechells,**
**Birmingham 7.**

(B 702)

**BRITISH JEFFREY-DIAMOND LTD.,**

require the services of an experienced

## A.C. MOTOR DESIGNER

able to undertake the electrical and mechanical design of the range of mining motors manufactured by the Company. This involves standard S.C. motors and special purpose motors where original development is necessary. The successful applicant will join a well established but quickly expanding company.

Replies to be addressed to the Secretary, British Jeffrey-Diamond Ltd., Stennard Wks, Wakefield. (B646)

## TRANSFORMERS (WATFORD) LIMITED

require, due to expansion

SENIOR and JUNIOR

## DRAUGHTSMEN

experienced on Power and Distribution transformers. Good salary, plus production bonus. Non-contributory pensions scheme. Excellent working conditions.

Apply, with full particulars:—

**Chief Draughtsman,**
**Transformers (Watford) Ltd.,**
**Sandown Rd, Watford, Herts.**

(B 647)

## TO ALL ELECTRICAL DESIGN ENGINEERS AND DRAUGHTSMEN

We are shortly moving into a new modern office building and have vacancies for Design Engineers and Draughtsmen who are interested in installation design in all classes of industrial and commercial buildings, including

AIRPORTS—NEW HOSPITALS—HOTELS—
OFFICE BLOCKS—UNIVERSITIES—SCHOOLS

both at home and abroad.

Spring and summer holidays, pension scheme and luncheon vouchers.

Apply in writing, stating age, experience, qualifications, present salary and salary required, to:

**J. ROGER PRESTON AND PARTNERS,**
**15 North Audley Street,**
**London W.1.**

(B 725)

## THE ENGLISH ELECTRIC CO. LTD.

**FRACTIONAL HORSE-POWER MOTOR DIVISION**

ENGLISH ELECTRIC invite applications for appointments to the outside sales staff specialising in sale of fractional horse power motors in a number of Branch territories, including the London area.

Qualified engineers already experienced in this field and engineers who feel that they have qualifications which would enable them to succeed in this field are invited to submit details of their experience and training, together with relevant personal data to Mr G. M. Smith, Dept. G.P.S., English Electric House, Strand, London W.C.2, quoting reference number ET/0097A.

(B 701)

Due to expansion the

## CONTROL GEAR DIVISION OF G.W.B. FURNACES LTD.

require additional

## ELECTRICAL ESTIMATORS

at their Dudley Works. Applicants must be capable of analysing customers' requirements, preparing circuit diagrams and composite tenders. No electronics involved. Technical qualifications to H.N.C. standard preferred. Possibility of eventual promotion to outside Sales Staff for men of the right personality.

The Works are situated in pleasant surroundings, and assistance with removal expenses will be given in approved cases.

Detailed applications, in confidence, which will be acknowledged, to Sales Manager, Control Gear Division, G.W.B. Furnaces Limited, P.O. Box No. 4, Dibdale Works, Dudley, Worcs.

(B 755)

**BRITISH INSULATED CALLENDER'S (SUBMARINE CABLES) LTD.**

require an

**ELECTRICAL ENGINEER**

to undertake development work on Submarine Power Cables and Accessories. The selected candidate will be required to organise and progress the development work up to production against customers' requirements. Applicants should hold an Engineering Degree, H.N.C. or its equivalent and preferably have a knowledge of power cable design and manufacture.

Staff Pension Scheme.

Canteen and Social Club facilities.

Applications should be addressed to the Secretary, British Insulated Callender's (Submarine Cables) Ltd., Trafford Pk, Manchester 17.

(B 712)

**CROMPTON PARKINSON (CHELMSFORD) LTD.**

require a

CHIEF OF ROTATING MACHINE TEST

The Company manufactures Industrial a.c. Motors/Generators up to 4,000 h.p./kVA; Industrial d.c. Motors/Generators up to 1,500 h.p./kW; and Traction d.c. Motors/Generators up to the largest sizes. The applicant is to be responsible for the testing of the whole of this equipment. Apply in confidence, giving particulars of age, experience and qualifications to Personnel Officer, Crompton Parkinson (Chelmsford) Ltd., Writtle Rd, Chelmsford.

(B 591)

## ELECTRICAL ENGINEERS AND DRAUGHTSMEN

Applications are invited from qualified Electrical Engineers and Draughtsmen, to work on nuclear and special engineering development projects in the fields of power application and automatic control. The positions are pensionable and offer a progressive career with the company.

Please write, giving full details of qualifications, age and experience to:

**Chief Engineer,**
**JOHN BROWN (S.E.N.D.) LIMITED,**
**20 Eastbourne Terrace,**
**London W.2.**

(B 696)

**J. & P.**

**SALES ENGINEERS**

required in

**BRADFORD AND SHEFFIELD**

Johnson and Phillips Ltd. have a vacancy at their Bradford Branch and another at their Sheffield Branch for a Sales Engineer to handle the sales of capacitors, switchgear, transformers and cables. These are permanent and responsible appointments with scope for advancement, and for which cars are provided.

Applications are invited from men with H.N.C. in electrical engineering. Qualified men without sales experience will be considered for training.

Applications, giving details of experience and training, should be addressed to the Employment Manager, Johnson and Phillips Ltd., Charlton, London S.E.7. (B 711)

## THE INSTITUTION OF ELECTRICAL ENGINEERS

Applications are invited for the appointment of SECRETARY of The Institution of Electrical Engineers, which will become effective in October, 1962, and should be sent to the President of The Institution, Savoy Place, London W.C.2, marked on the top left-hand corner "Secretaryship," to arrive not later than 20 Sept., 1961. Candidates should preferably be between the ages of 40 and 50 years and desirably be Corporate Members of The Institution. There is an adequate superannuation scheme, and the conditions of service and salary will be commensurate with the high responsibility of the post, but not less than the basic figure of £4,000. The selected candidate would be required to commence his service in June, 1962, and work for three months in collaboration with the retiring Secretary. (B 697)

# IT ALL ADDS UP!—

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**KDP10***
**DEUCE***

**CAREER**

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This is a problem in conventional decimal addition

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will solve it—and problems in Data Processing

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Possession of them will enable you to solve the problem

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**Data Processing Division, Room ET 316C**
**English Electric Co. Ltd., Stoke-on-Trent, Staffs.**

* *These are Computers by*

**'ENGLISH ELECTRIC'**

(B 730)

**CENTRAL ELECTRICITY GENERATING BOARD**

**South Wales Division**

Vacancy No. 253/ET/61.

APPLICATIONS are invited for the superannuable N.J.B. appointment of STATION SHIFT CONTROL ENGINEER

Upper Boat Power Station, near Pontypridd, Glam.

Salary: Class H, Grade 10, Scale 7, £965/£1,090 per annum, plus 10% shift allowance.

Applicants should possess H.N.C. or equivalent qualifications and have had operating experience in a power station.

Special application forms obtainable from Divisional Secretary, Central Electricity Generating Board, South Wales Division, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 16 Sept., 1961. (B 732)

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APPLICATIONS are invited for the appointment of a JUNIOR ELECTRICAL ENGINEERING ASSISTANT. Applicants, preferably having served an apprenticeship at a manufacturer's works, should be graduate members of the I.E.E. and have had considerable experience in the installation and operation of light and heavy electrical equipment. Knowledge of radio an advantage. Applications giving full details of age, experience, etc., and salary required, should be addressed to Engineer-in-Chief, The South Staffordshire Waterworks Co., 50 Sheepcote St, Birmingham 15. (B 709)

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APPLICATIONS are invited by Kennedy and Donkin, 12 Caxton St, London S.W.1 (Ref. RFL), for an ASSISTANT in the Cable Department at their Weybridge Office. Applicants must be qualified electrical engineers with experience in design, manufacture and installation of cables for transmission and generation projects. (B 710)

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CROMPTON PARKINSON LIMITED require a SALES ENGINEER for their Overseas Division, London. The work will include liaison between home and overseas factories and the Company's world-wide marketing organisation, as well as assistance in the export sales promotion of the Company's Rotating Plant Products. A really go-ahead young man should find excellent opportunity through this appointment.

Applications, including details of education, experience and salary required, should be sent to Ref.: XS, Crompton Parkinson Ltd., Crompton Hse, Aldwych, London W.C.2. (B 750)

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ENGINEER with water tube boiler experience (Power Station and Industrial), particularly knowledge of oil and other fluid fuels covering design installation and commissioning. Progressive position for energetic applicant with administrative ability. State experience, age, and salary required, Box 926, Granthams Advertising, Reading. (B 703)

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ELECTRICAL WHOLESALERS require REPRESENTATIVE for area approx. 30 miles radius Watford. Remuneration will be by Salary and Commission. A car will be provided. Apply in writing, giving details of experience, etc. Russell's Supplies Ltd., Loates La, Watford. (B 751)

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ELECTRICAL ENGINEERING ASSISTANT for London office staff of construction company dealing with contracting work for electrical transmission and distribution, cables and overhead lines, all voltages. Age range 21-35. We are particularly interested in applicants with O.N.C. or H.N.C. Electrical Engineering, or equivalent, but other technical qualifications will be considered. Write: Commercial Manager, A.E.I. Ltd., Construction (Cables & Lines) Division, 59-62 High Holborn, London W.C.1. (B 602)

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# INDEX TO ADVERTISERS


Aberdare Cables Ltd. ... ... *Cover (iv)*

A.E.I. Lamp & Lighting Ltd. ... *Cover (i)*

Associated Electrical Industries Ltd. (Transformer Division) ... ... 28

Atlas Lighting Ltd. ... ... ... 43

Backer Electric Co. Ltd. ... ... 25

Bayliss, Jones & Bayliss Ltd. ... ... 7

British Insulated Callender's Cables Ltd. 22

Bullers Ltd. ... ... ... ... 45

Chloride Batteries Ltd. ... ... 4

Critchley Bros. Ltd. ... ... ... 25

Crompton Parkinson Ltd. ... ... 48

Dowling, David, Ltd. ... ... ... 26

*Electrical Times Ltd.* ... 40A, 42, 44, 46

E.C.C. (Moulded Breakers) Ltd. ... 30

E.M.B. Co. Ltd. ... ... ... ... 32

Enfield-Standard Power Cables Ltd. ... 3

English Electric Co. Ltd. (Fusegear) ... 13

Ferranti Ltd. ... ... ... ... 21

Fuller Electric Ltd. ... ... ... 9

General Electric Co. Ltd. ... 5, 6, 26, 44

Hawkins, T. P. & Son Ltd. ... ... 14

Injection Moulders Ltd. ... ... ...40B

Johnson & Phillips Ltd. ... ... 17

London Electric Wire Co. & Smiths Ltd. 8

Midland Electric Manufacturing Co. Ltd. 2

Morganite Carbon Ltd. ... ... ... 41

Oddie, Bradbury & Cull Ltd. ... ... 46

Parmiter Hope & Sugden Ltd.... *Cover (iii)*

Permali Ltd. ... ... ... ... 16

Pyrotenax Ltd. ... ... ... ... 19

Reyrolle, A. & Co. Ltd. ... ... 27

Rowlands Electrical Accessories Ltd. ... 26

Sanders, Wm. & Co. (Wednesbury) Ltd. ... ... ... ... ... 10

Scholes, Geo. H. & Co. Ltd. ... *Cover (ii)*

Scott, H. J. & Co. (Belfast) Ltd. ... 23

Shell Mex & B.P. Ltd. ... ... ... 47

Simmonds & Stokes (Niphan) Ltd. ... 46

Simplex Electric Co. Ltd. ... ... 20

Taylor Tunnicliff & Co. Ltd. ... ... 18

Thorn Electrical Industries Ltd. ... 15

Walsall Conduits Ltd. ... ... ... 1

Washington Engineering Ltd. ... ... 42

Westinghouse Brake & Signal Co. Ltd. 24

Wolverhampton Die Casting Co. Ltd. 31

Wootton & Co. Ltd. ... ... ... 44

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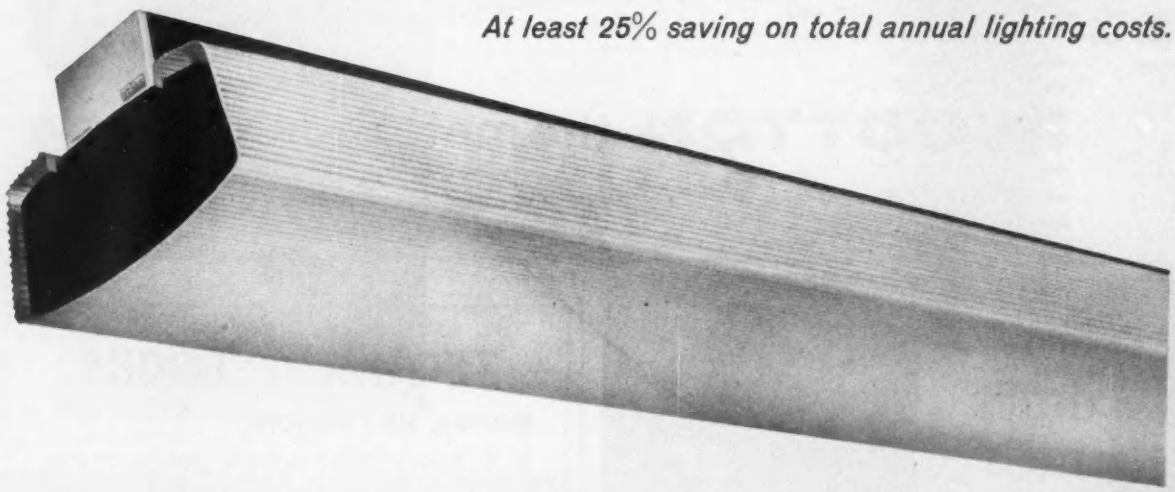

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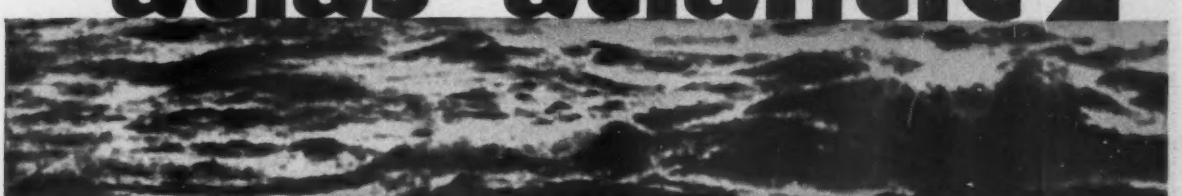

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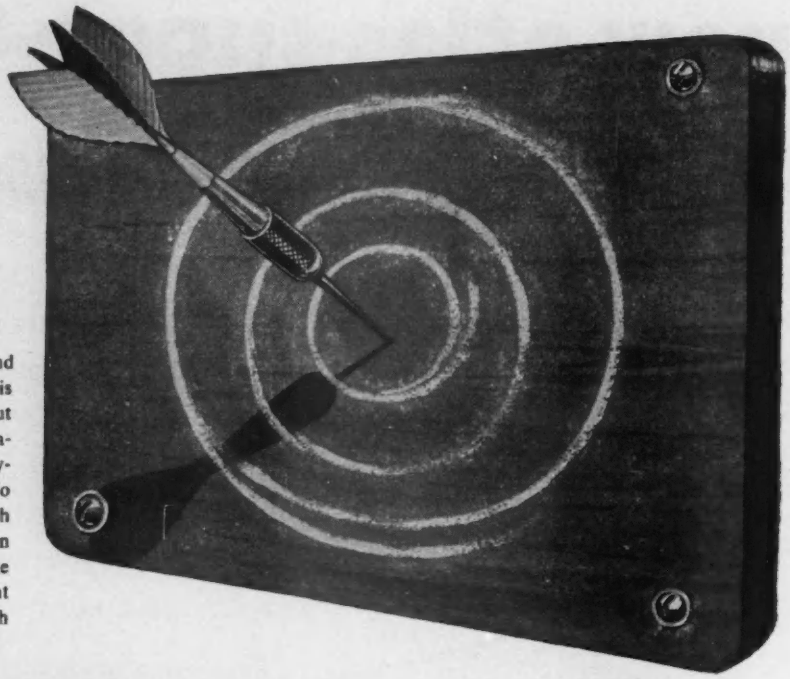

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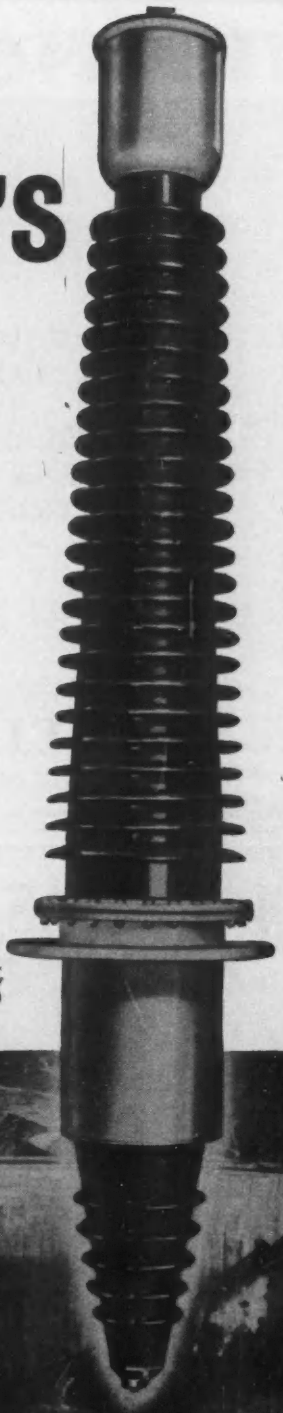

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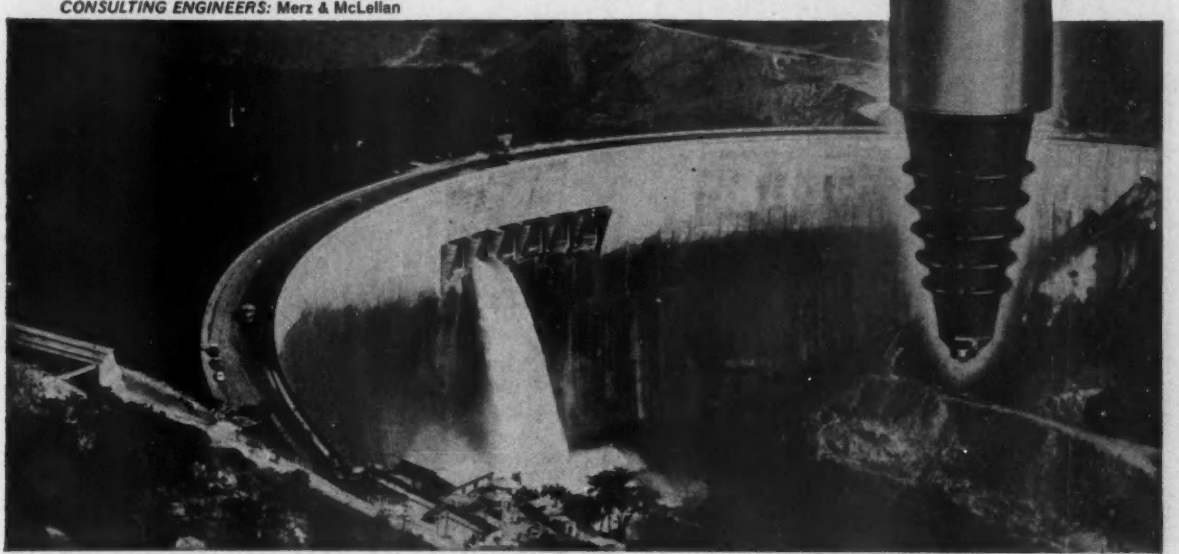

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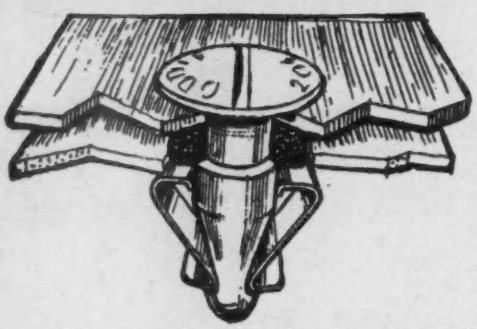

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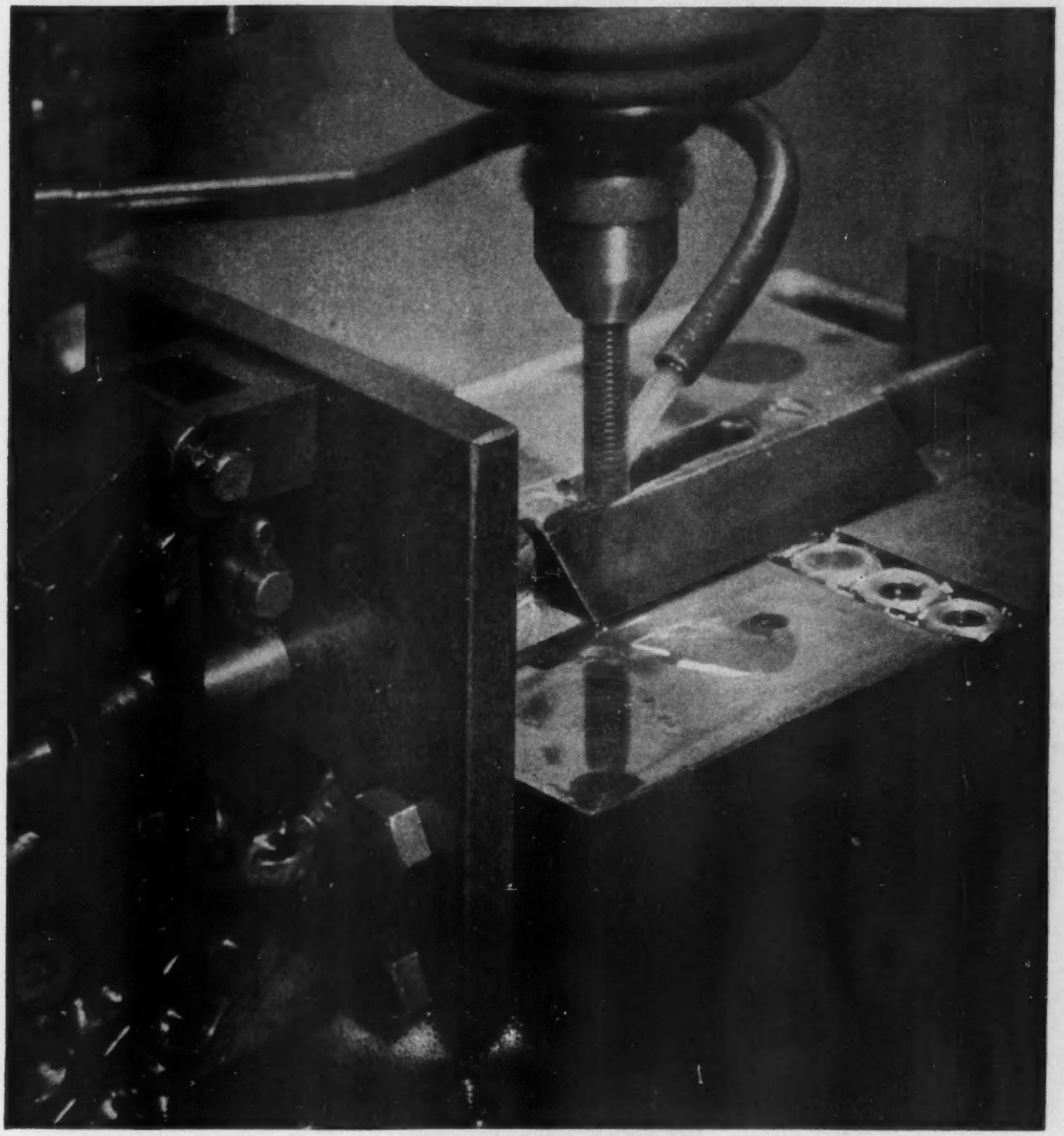

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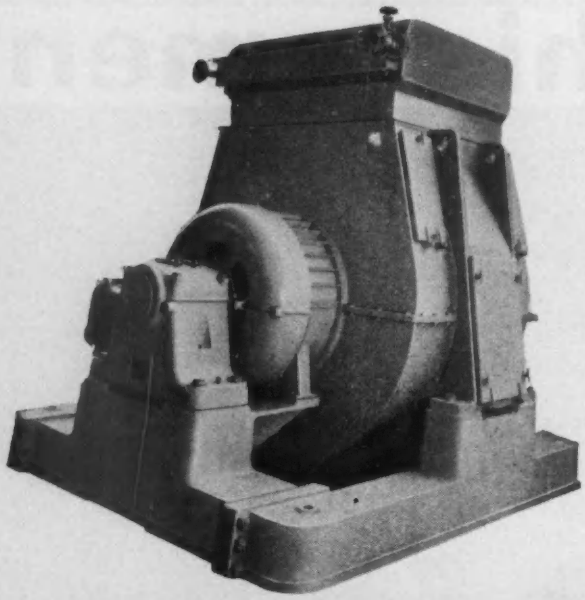

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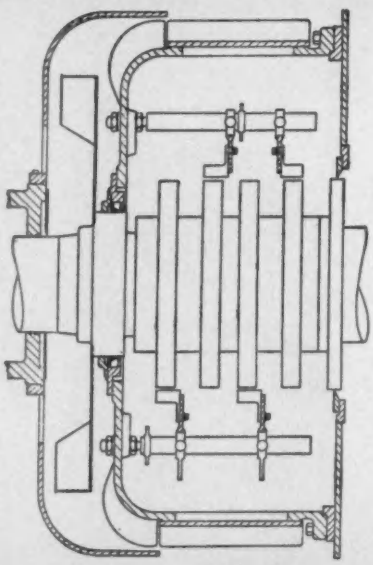

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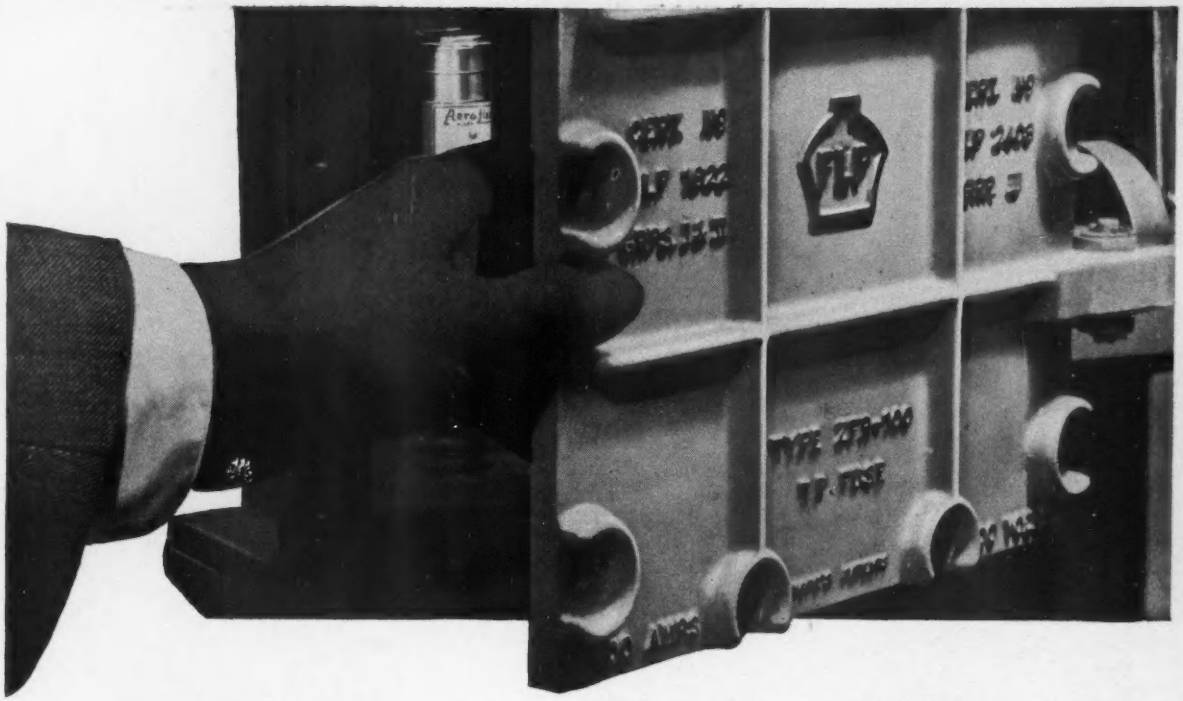

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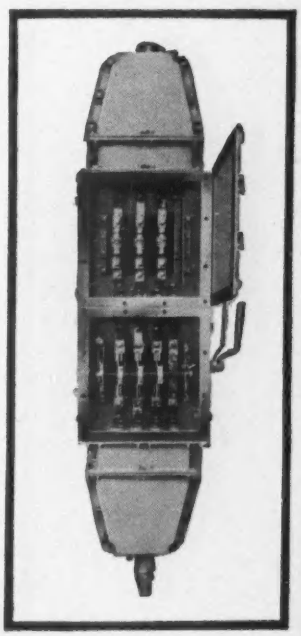

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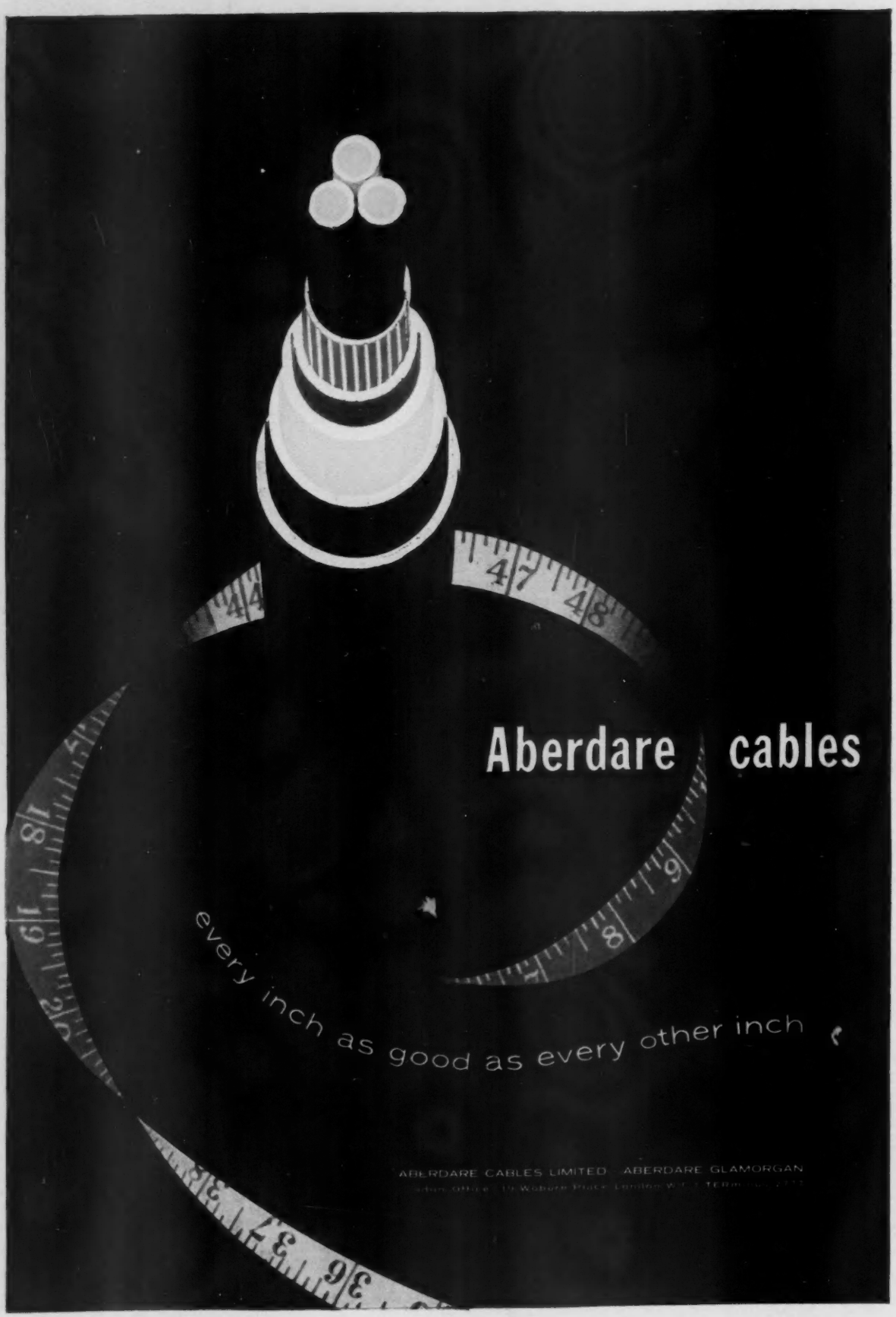
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